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The Fuel Conference, 1928.

THAT the recent sectional meeting of the World Power Conference was on the whole highly successful will be agreed; it brought together an immense amount of information on subjects of the first importance to the nations which took part in it, and in all probability it will give rise to further developments in the form of international co-operation and agreements leading towards the standardisation of practice and the recognition of statistical data—as in the sampling of coal and the compilation of universally accepted tables of the properties of steam—which will bear fruit in the future. As Mr. D. N. Dunlop remarked in bringing the proceedings to a close, the World Power Conference has developed at a rate which he never anticipated when he first put forward the idea of creating such an organisation; and the fact that sectional meetings are to be held both in Barcelona and in Japan next year, followed by a full World Power Conference in Berlin in 1930, not only indicates the popularity of these international Parliaments but also testifies to the world-wide appeal of the subjects of their debates. No better method has ever been found, apparently, of engaging the interest of the nations in common pursuits. The League of Nations is an affair of Governments, with a totally different constitution; the Conference is purely non-political, largely supported by individuals, and wholly voluntary in character. We do not forget the International Electrotechnical Commission and similar organisations of great value to science and industry, but the Power Conference has the broadest scope and makes the strongest appeal to the public understanding—especially in these days of reconstruction and reorganisation of the world's resources and industries; moreover, it has been able to profit by the experience of its forerunners, which evolved the practice of holding sectional meetings and showed how best such conferences could be conducted.

Doubtless many lessons will be derived from the proceedings of the Fuel Conference, in addition to the mass of knowledge and experience embodied in the official *Transactions*. We may point out, without imputing blame, that the discussions in some cases were hardly up to the level of the papers, and that in general they showed a marked tendency to concentrate on questions

mainly British in complexion; that, no doubt, was in great part due to the place of meeting, to the large attendance of British members, and to difficulties of language—we shall not expect to hear that British problems hold the floor at the meeting in Japan next year. Few names of foreigners appear in our reports of the discussions. However, the papers were as cosmopolitan as could be wished, and we hope that our many visitors from overseas will feel well repaid for their trouble. Not least of their reward has been the valuable opportunity of meeting their *confrères* from all parts of the world, renewing old friendships, and making new acquaintances.

Electricity for Domestic Heating.

One of the most interesting sessions of the Fuel Conference was that which dealt with "the utilisation of fuels, including electricity, for domestic purposes" (*i.e.*, for heating; lighting and power were hardly mentioned). The discussion, it is true, contributed little to the stock of knowledge, but some of the papers were of outstanding value. Comparisons between coal, coke, gas, and electricity as heating agencies were freely made, and on the whole the advocates of "electricity for everything" may take heart from the views that were put forward.

Apart from the question of cost, of course electricity was frankly recognised as the ideal source of heat in the home. We need not here dwell upon its advantages, with which our readers are fully acquainted; as Mr. H W. Derry, of the National Electric Light Association, U.S.A., truly said in his paper, "we can safely make the fundamental premise that, all things being equal, the great majority of the people of the world would use electricity for house heating purposes in preference to any other known fuel." He estimated that with coal at 41s. a ton, gas at 4s. 2d. a thousand cubic feet, and electricity at ½d. per kWh, the relative costs assuming average efficiencies were 4½d., 1s. 5d., and 1s. 3d. per 100,000 B.th.u. for domestic heating. Gas is in many British towns cheaper than the price quoted, and electricity for heating is usually about 1d. per kWh; consequently the latter in this country, on Mr. Derry's bases of efficiency, would cost rather more than twice as much as gas—but there are instances where electricity for heating is sold at ½d. per kWh, and at that price, having regard to its inherent advantages, it is unquestionably on a par with gas. Electricity can never hope to compete with coal or coke on the score of cost alone; yet, as Dr. Margaret Fishenden showed in her masterly paper, owing to the low efficiency of coal when burnt in open grates, electric heating does not necessarily involve a greater consumption of fuel than heating with coal. For intermittent heating, aggregating, say, four hours a day, electricity (says Dr. Fishenden) costs about the same as coal, at 1d. per kWh. For heating water she says that electricity at less than ½d. a kWh is comparable in cost with gas; and for cooking, the costs of coal, gas, and electricity (at 1d. a kWh) are all about the same.

Dr. Fishenden is so rigidly impartial that her observations can hardly be questioned, so far as they relate to quantities capable of measurement. Taking coal at 45s. a ton, gas at 10d. a therm, and electricity at 1d. a kWh, she gives the fuel costs for equivalent radiation emission, with stated efficiencies, as in the ratio 1:2.5: 4.3; allowing for the differences in price, her figures very fairly correspond with Mr. Derry's.

It is very well to make such comparisons on the basis of actual cost of the heating agent, but as all know who have tried it, with electricity we gain so many incidental benefits that it is well worth while to pay more for it in order to enjoy them.

In California, we learn, the application of electricity to heating meets with almost ideal conditions, the demand occurring for short periods in the morning and evening throughout the year, at times when other loads are off; not only are houses heated, but also public buildings, schools, shops, and offices, "with results that surpass anything yet developed and at costs that are so gratifying that each installation generally leads to others. There are many all-electric apartment houses, some of them built without chimneys." At Los Angeles a building of 170 apartments is being erected, in which 533 electric heaters of about 4 kW each will be installed, and there will be no chimneys except one for the "garbage incinerator." Heating loads in small houses often amount to 20 or 30 kW.

German Industrial Progress.

In another part of this issue extracts are reproduced from the lengthy official report on "Economic and Financial Conditions in Germany" during 1927 and down to June last. The report bears ample testimony to the remarkable progress which has been made in recent years by the various industries dealt with, and although it would be unwise to make a prediction, it would appear that unless unforeseen circumstances arise, Germany will have almost recovered her pre-war position in industry and trade in the course of the next two or three years. The development in this direction is being assisted by the Government, which is controlling directly or indirectly the home trade in coal and steel, and consequently helping inland industrial consumers to promote export trade. The sale prices of coal are fixed by the Coal Board, which, in turn, is subject to the Minister for Economic Affairs. Recently the Minister has decided that any syndicate increase in the prices of steel must be previously notified to him, and he can apparently approve or object. In stating that "there is a great lack of publicity," the report merely confirms what has been noticed for several years past in Germany, excepting in the cases of coal, steel, shipping and shipbuilding. In fact the reticence has become so pronounced as to suggest that the Germans are afraid of letting any information become public, as it might assist foreign competitors.

Electrically-Driven Cotton Looms.

Many Lancashire mills are driven to-day by mill engines that have given about half a century's service. In some cases conservatism has been responsible for this, although on the fine-spinning side of the industry, which has remained comparatively prosperous throughout the trade depression, a number of mills have been converted to the electric drive. Many mills are driven by one unit, but the individual drive has decided advantages. In the spinning mill, when each frame is individually driven, there is increased production because a stoppage of one frame does not affect the others. A steady drive is essential, and this is one of the chief arguments for the electric drive.

In the average weaving shed the equipment is not always up to date and looms are in use which would be scrapped were the capital available for replacing them, yet the weaving loom has stimulated the interest of the electrical engineer probably more than any other textile machine, and it is not difficult to see the reason for this, as, first, there are more looms than any other textile machine and, secondly, the loom is the machine which has best responded in respect of increased production to the application of improved driving such as is provided by the electric motor. In any particular cotton mill, provided that reasonable prices for electricity obtain in the district, electrical driving is the best means to adopt from the points of view of economy in running, increase in production, and convenience. Comparing the individual and group methods of electrically driving looms in a weaving shed, it is now generally recognised that the individual drive is the best to adopt. The drive is positive, ensuring freedom from slip during normal running and, consequently, the output per loom is high. The quality of the product of the electrically-driven loom is exceptional, and there is so much to recommend it that, as a large manufacturer said recently, there is certain to be a conversion of many weaving sheds to the individual electric drive as soon as the cotton trade becomes normal.

Lieut.-Col. Kenelm Edgcumbe.

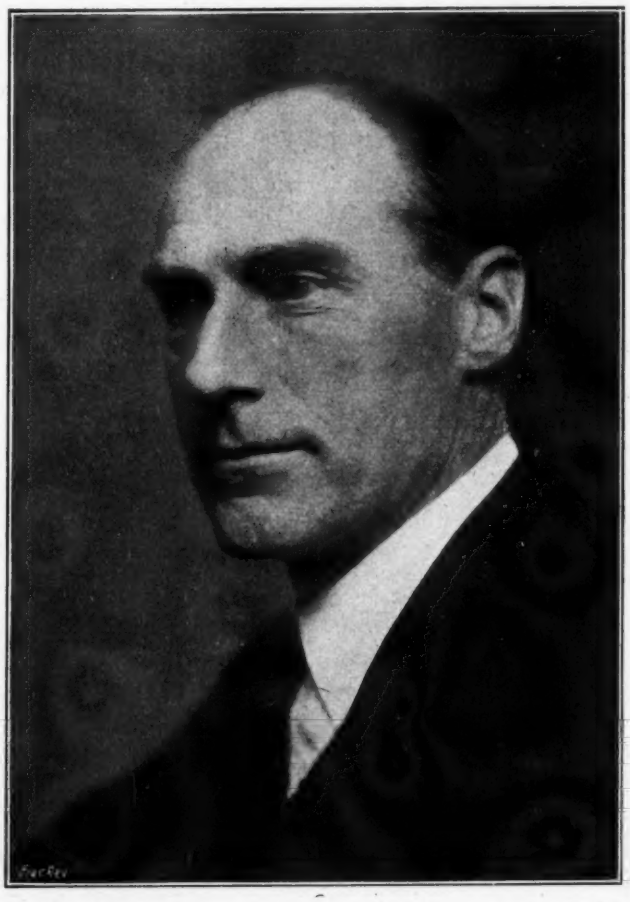
President of the Institution of Electrical Engineers.

LIEUT.-Col. Kenelm Edgcumbe, T.D., R.E. (T.A.) (ret.), M.Inst.C.E., M.I.E.E., F.Inst.P., has many qualifications for his new post—or his larger command, as those who have worn the King's uniform under him may regard it. In the immediate *post-bellum* past there have been years of service as an ordinary member of Council of the I.E.E. from 1922 to 1925, and as vice-president from 1925 till now. There were yet other duties in connection with the International Electrotechnical Commission, and in succession to Sir Richard Glazebrook as honorary secretary; Colonel Edgcumbe is the third president of the I.E.E. to fill that office, as Sir Richard Glazebrook succeeded Colonel Crompton. This would serve to mark him as so pre-eminently fitted for his new task that the stranger who knew him not would be well satisfied with such credentials and require no confirmatory data.

Others concerned with the catholicity of the Institution will see the essential fitness of the election of one who is not merely concerned in the electrical manufacturing industry as chairman and joint managing director of Messrs. Everett, Edgcumbe & Co., Ltd., but is also interested so intimately in applied science. From the early days in 1900 (when that firm started with works in Charterhouse Square, London, removing two years later to Saffron Hill, and again moving in 1904 to the site of the present works at Hendon), Colonel Edgcumbe has continuously identified himself with the design of electrical measuring instruments, protective relays, and similar gear, and has contributed numerous papers on these subjects to various institutions, &c., notably three to the Institution of Electrical Engineers in 1904, 1920, and 1927. The last paper, which he read in conjunction with Mr. F. Ockenden, established a number of new features in connection with such instruments. For example, it was there shown how current transformers could be designed to give an accuracy previously unattainable, and how the hysteresis error in moving-iron instruments might be eliminated.

This does not by any means exhaust the record of his technical activity, for mention may be made of his work in connection with the British Engineering Standards Association, in which he is Chairman of the Sectional Committee on Illumination. He is also a member of the Electrical Sectional Committee, on which he represents the Institution of Electrical Engineers, besides serving on a number of sub-committees, and he has taken a prominent part in the preparation of the *Glossary of Electrical Engineering Terms*, recently published by the B.E.S.A. There has also been his connection with the Electrical Research Association, of which he is a member of Council, and the International Illumination Commission, of which he is a Vice-President and Chairman of the British National Committee.

There are other aspects of his personality which those who served under him before, during, and after the war, feel that they know more intimately and esteem more highly than others not so privileged. They know of a cold logical appraisement of every difficulty, a finger as inexorable as fate placed on the weak point in a scheme, on a source of waste, or on slackness of discipline. Very often it was realised by officers and N.C.O.'s of outlying detachments that the O.-in-C., Defence Lights, Plymouth Garrison, knew more about their job than they did. They realised, too, that the clear brain owned a vivid sense of humour and a searching wit.



Elliott & Fry] [*London.*

Lieut.-Col. K. Edgcumbe, T.D., R.E. (T.A.).

He had always been a keen Territorial. In 1898 he became a "sapper" in the London Electrical Engineers Volunteers, formed by Dr. John Hopkinson, when President of the Institution. He served as a major throughout the Great War, and was given command of the 11th Anti-Aircraft Battalion, R.E., formed in 1922, retiring in 1925 with the Territorial Decoration and the rank of Lieutenant-Colonel.

Family tradition took him first to Harrow, just as later in life the like tradition took him to the Athenæum Club to rub shoulders with his old school-fellows, who, following the old paths, had become statesmen, bishops, diplomats, and the like. An apparent breach with tradition—or, rather, the founding of a new tradition—took him from Harrow to study at Dresden and University College, London, and thence to a pupilage at Chelmsford with Messrs. Crompton & Co. in 1893. The ascendancy of the new tradition continued in his lectureship at the newly-formed Northampton Polytechnic Institute in London from 1897 to 1900. The latest stage in the development of the new tradition lies in the election of an old Harrovian to the Presidential Chair of the newest, but largest, of our three great Engineering Institutions.

All will wish him a pleasant period of office, knowing that the presidential chair is occupied by one well fitted in character, temperament, and attainments to perform the duties of that distinguished post.

A Large Overhead-Line System.

Some constructional features of the overhead-line system of the Perak hydro-electric scheme, in the Federated Malay States.

VERY considerable electrical developments are taking place in the Federated Malay States, and the following particulars concern the large hydro-electric distribution scheme which is at present proceeding for the Perak River Hydro-Electric Power Co., Ltd., in the State of Perak. The consultants for this work are Messrs. Rendel, Palmer & Tritton, and the work is being carried out under contract by British Insulated Cables, Ltd.

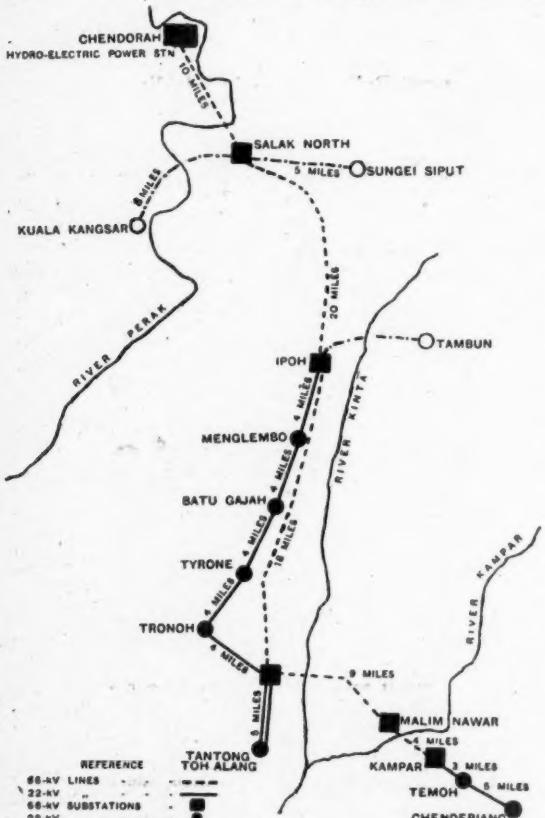


Fig. 1.—Transmission System of Perak Hydro-Electric Scheme.

From the sketch map of the district shown in fig. 1, it will be seen that the scheme covers a considerable area and includes all the more populous towns in the Kinta Valley. This part is rapidly developing owing to the rich tin mines in the district which the system is primarily designed to serve; the supply will also be available for the rubber estates and a bulk supply to the various villages by means of outdoor sub-stations.

The main hydro-electric station is established at Chendorah on the higher reaches of the River Perak, and although the head of water is somewhat small, there is an immense volume which will more than meet the requirements at all seasons of the year. In addition, there is a steam station established to supply the more concentrated area round Malim Nawar.

The lay-out of the overhead work will embody three systems at 66,000, 22,000, and 6,600 V, respectively. A primary 3-phase system at 66,000 V will be employed for coupling up the two stations at Chendorah and Malim Nawar, and also feeding outdoor sub-stations in the intervening districts. The main feeder will consist of a double circuit of six 0.125-sq. in. stranded copper wires supported on lattice-work steel towers normally 68 ft. high, with provision for extensions of 10 ft. in order to meet irregularities of the ground contour. The normal span is 660 ft. and a minimum clearance to the ground level of 20 ft. at 120 deg. F. is provided for.

The towers are of the square-base pattern, with separate earth footings at each corner leg. The grillage for these is set in a pad of concrete, and steel plates are attached to the stub below the ground level in order to provide against the lateral shear stresses exerted on the foundation. A continuous longitudinal 0.05-sq. in. stranded copper earth wire is provided and is fixed to the apex of the tower. The route is approximately 60 miles long, exclusive of future branches. The insulators will be of the standard suspension type with six disks per string, the terminals being double-stringed sets.

A secondary 3-phase system at 22,000 V will be employed to provide for the more congested area round Malim Nawar, and it will be fed by the steam station at this town. The towers for this system are of similar design to those of the higher-voltage system, and are normally 50 ft. high; extensions are also provided for in this case. They are designed for single and double circuits, and will normally carry six 0.1-sq. in. stranded copper wires with a longitudinal 0.05-sq. in copper earth wire at the apex. The insulators will be of the petticoated pin type on straight-line work, with disk-type insulators at the terminals.

On both the above-mentioned systems three types of towers are provided, *viz.*, intermediate (straight line), angle and transposition. The terminations are made on to the steel structural work of the outdoor sub-stations. All the steelwork is of British manufacture and is galvanised. The present route length of the

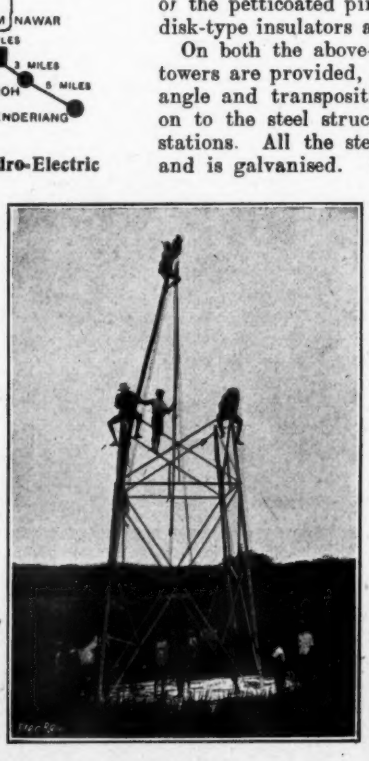


Fig. 2.—66-kV Straight-line Pole during Erection.

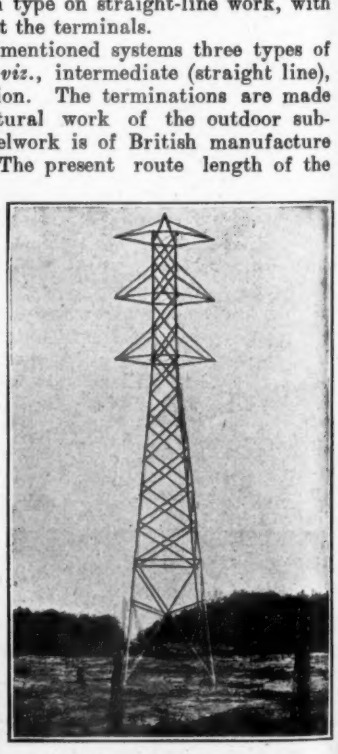


Fig. 3.—Completed 66-kV Tower at Malim Nawar.

system is approximately 30 miles. A tertiary 3-phase system at 6,600 V will provide for distribution from the step-down sub-stations to various mines and villages. The conductors for this work will be of three different sizes, 0.046, 0.035, and 0.022 sq. in., with a copper earth wire of the last-named size. They will be supported on solid-drawn tubular steel poles by means of channel cross-arms and pin-type insulators, with terminating insulators of the single-disk type. The branch lines at present provided for total 50 miles.

An entirely separate communication line will also be provided; this will consist of single and double metallic circuits of 100-lb. bronze wire supported by steel poles on single insulators on brackets. The minimum distance between the communication and transmission lines is to be 35 ft. In order to provide for additional protection from inductive interference, the whole of the insulators are being supported on single brackets to facilitate rotary construction, in addition to the e.h.p. lines being periodically transposed.

British Insulated Cables, Ltd., sent out a staff to carry out the work at the commencement of the present year, and it has been concentrating on the southern sections of the work, in order to enable a supply to be given from the steam station situated at Malim Nawar. Some of the sections of overhead work are now completed. Fig. 2 shows a 66,000-V tower being erected on the unit principle by Malay workers, and fig. 3 illustrates a similar tower when completely erected.

It will be realised that before erection a great amount of jungle had to be cleared, and this is one of the chief difficulties the construction gangs have had to contend with; in this connection survey and clearing parties have been sent ahead of the working gangs.

All the materials used on the work are of British manufacture, and the following list gives the total amounts required and the suppliers:—Steel towers, 700 (approx. 1,500 tons), supplied by Messrs. C. T. Wilkinson, Ltd. Tubular steel poles, 1,300, supplied by Messrs. Stewart & Lloyds, Ltd. Telephone steel poles, 2,000, supplied by British Mannesmann Tube Co., Ltd. Six-disk insulator strings, 2,000, supplied by Messrs. Bullers, Ltd. Single-disk insulators, 2,000, supplied by Messrs. Bullers, Ltd. 22-kV pin-type insulators, 1,000, supplied by Messrs. Bullers, Ltd. 6.6-kV pin-type insulators, 4,500, supplied by Messrs. Bullers, Ltd. Telephone-line insulators, 5,000, supplied by British Insulated Cables, Ltd. Channel arms, brackets, guards, and line fittings, supplied by British Insulated Cables, Ltd. Copper conductors, various sizes, 700 miles, supplied by British Insulated Cables, Ltd. Telephone wire, 180 miles, supplied by British Insulated Cables, Ltd.

Rail Conditions of Carriage.

Effect of the New Rules.

By J. W. PARKER, A.M.Inst.T.

So long as the transport of goods runs smoothly along, little or no thought is given to conditions of carriage. It is only when difficulties arise that one remembers that the forwarding of merchandise is a legal contract, the consequences of which need to be properly appreciated if awkward points are always to be avoided. Particularly is this the case when the terms of the contract have been revised, responsibilities altered, and privileges changed, as has happened during the current year.

The law governing railway transits is now being cleared up, re-written and codified. The magnitude of the changes is perhaps best realised when it is recalled that the law concerning the relations of railways and their customers as expressed in the conditions of carriage, had grown up over a long period of time. It was thus almost inevitable that some of the clauses should be obsolete, others of doubtful application because they had never been put to the test, whilst others still were somewhat ambiguous in wording and intention. To have them all revised and brought into line with present-day requirements was thus an undertaking of considerable importance rendered the more acceptable to the rail-user because the whole of the rules are now set forth in one clearly-phrased pamphlet. Anyone may consult this and ascertain precisely how he stands in any given difficulty. More important than this is it to know that the whole of the rules, in the words of the Railways Act, are "deemed to be reasonable." In the past, the word "reasonable" has caused endless disputes and a great deal of litigation. It is then an added satisfaction for the future to know that this "red herring" has been finally disposed of.

In determining the new rules, the hitherto unprecedented course of consulting rail-users was taken in an attempt to secure satisfactory terms. The railways first drafted the clauses, after which they submitted them to a representative body of traders for comment. A spirit of give-and-take manifested throughout a series of round-table discussions, moulded most of the clauses until they became acceptable to each side. Naturally, this happy result was not attained in every instance, but where agreement proved impossible, both sides were allowed to take their objections before the Rates Tribunal, and that body decided the final form of the disputed rule. For the most part, then, the new regulations represent the agreed opinions of railways and their customers, a point which it is desirable to keep in mind in case any particular rule should come in for criticism.

Perhaps the first visible indication of a change in the conveyance conditions is found in the present consignment notes. The old forms had a number of conditions printed on the back which, when signed in the usual manner, had the effect of binding the sender, but not only are the new documents entirely devoid of such printed matter, but they need not be signed; in fact, it is not even necessary to use the orthodox form at all! None the less, the contract is enforceable and cannot be avoided unless it is expressly annulled in writing. To some firms this arrangement is a drawback, as previously concerns which used their own form of consignment note, were able to avoid some of the railways' conditions, merely because they did not subscribe their signature to them. Now, however, all firms are on the same footing, not one being able to secure preferential treatment in this respect. The results of this change go further, as they mean the abolition of the special form of owner's risk consignment note. To consign goods at owner's risk to-day, all it is necessary to do is to insert the letters O.R. on the note. These letters, it may be observed, are now recognised at law.

The standard terms and conditions of carriage, as the revised rules are termed, appear in various divisions, such as ordinary goods at carrier's and owner's risk, coal, livestock, dangerous goods, &c., but as they have all many features in common, comment will be confined

to the regulations governing ordinary merchandise at company's risk.

It has already been mentioned that a consignment note has no longer any legal significance, yet the sender is bound to give full details of the nature, weight, &c., of all merchandise offered for conveyance; indeed, if anything, his responsibilities are increased, because the precise details that he must render are specified in the rules. At the same time, the railways are placed under a definite obligation to give a signature for goods handed to them. They cannot be compelled to make out a receipt, but they must, if required, sign the sender's "goods outward" book, or some similar document. Any such signature is no evidence as to quantity or condition; it remains a simple receipt.

The private siding owner is likewise legally obliged to fix a label on each side of all outgoing loaded vehicles in order to show the wagon number, destination, and various other details. There being many cases where siding owners do not at present undertake this task, the railways have given a promise to the Tribunal to the effect that they have no intention of disturbing *existing* practice. All the same, the companies can enforce a charge should they so desire.

The rule of greatest importance is naturally the one dealing with the railways' liability during the transit of goods. An extensive alteration is evident here, in so far as the companies assume responsibility in certain events instead of it being necessary for the owner to prove negligence. Whereas under the old rule the *claimant* had to prove negligence against the railways, the new arrangement makes the *carriers* disprove negligence. In effect, the onus is shifted from the trader to the railways. Whilst this is undoubtedly an important gain to rail-users, it is in some degree offset by a concession made by traders, which will be mentioned later. The railways have never been responsible for damage, &c., due to what are termed the "excepted perils." These include such things as the act of God, King's enemies, inherent vice of the object carried, natural wear and tear, trader's fraud, and other well-known causes. To this list of exceptions has now been added a "casualty," an event described as an accident which could not have been avoided by the exercise of all due care and foresight. It specifically includes both a fire and an explosion. The inclusion of this peril appreciably lessens a carrier's common law liability, but it was conceded in recognition of the railways' having undertaken more than their strict responsibility in respect of disproving negligence.

One of the most serious differences of opinion between the railways and their customers occurred when the time limit for claims was under discussion. The traders contended that a three-days' limit was insufficient, as it resulted in many otherwise sound claims being rejected because they were "out of date." In some instances it was entirely impossible to render a written claim within three days of the end of the transit as the old regulations required. On their part, the railways resisted any extension of time on the grounds that a condition which had been in force for upwards of 60 years could not really be unjust, or it would not have survived.

Moreover, they required the earliest possible intimation of a claim to enable them to begin their investigations whilst the circumstances of the case were fresh in the minds of the people concerned. Neither side being disposed to give way, the Tribunal had to cut the knot. It decided that whilst intimation of damage, &c., must be given within three days, the claim itself might be made within seven days. In addition, should any extraordinary difficulty arise, a longer period might be allowed. It is doubtful if this concession would have satisfied the trader had the railway representative not declared in the open Court that the rule would be interpreted generously. The trader is therefore justified in looking to the railways to show some leniency towards "out of date" claims despite the actual wording of the clause. In the case of goods not delivered, the limit of 14 days from the date of dispatch is extended to 28, a concession that ought to go a long way towards clearing up the unsatisfactory state of affairs hitherto associated with goods lost in transit.

Delicate points of law have always been involved in the consideration of lien rights, but much uncertainty has now been dispelled, unfortunately, to the detriment of the rail-user. As things were, the railways could not detain one article as a means of enforcing payment of carriage charges upon goods already relivered; that is, they had a particular lien only. If they wished to hold any or all goods as a lever to enforce payment, they had to possess general lien powers, but they could not gain this privilege except by an agreement. For such purposes, a clause in a ledger credit deed constituted an agreement, but as some firms refused to have a clause of this kind, and other firms did not possess ledger credit, general lien powers were by no means the rule. The revised terms altered all this by unreservedly placing general lien authority in the hands of the railways. For the trader, the upshot is a need for very much more care should any lien question arise in the future.

Where electrical appliances and machinery are concerned, it is essential to know that one of the standard terms imposes a warranty on the sender of goods. This practice is familiar enough in marine transport, but has not previously been associated with rail conveyance. Now all goods are warranted to be fit for transport or warehousing in the condition they are handed to the carriers, and further warranted not to be of dangerous character. To avoid the consequence of this, it is necessary to give written notice when the goods are tendered for transit.

Whilst the trader gains substantial advantages from the standard conditions, the danger of losing their protection should not be overlooked. By means of a special agreement it is possible to sign away these advantages, a case in point being the sanctioning of a ledger credit deed containing the old or some equally onerous terms. Any firm entering into a ledger agreement should scrutinise its clauses closely to ensure that none of them is at variance with the standard conditions. With this reservation, the new rules can be commended to the careful attention of all rail-users.

Manchester Electro-Harmonic Society.

The Manchester Electro-Harmonic Society commences its tenth season this month, arrangements having been completed for a series of smoking concerts. The membership has increased to such an extent that larger accommodation has been secured; the meetings have previously been held in the small dining room of the "Manchester Limited," but in future the Society will meet in the large hall. The concerts are to be held on the following dates: October 19th, November 16th, December 14th, January 18th, February 15th, and March 15th. Electrical men who visit Manchester on these dates are cordially invited to attend the concerts. The programmes are organised by a Music Committee consisting of Messrs. H. R. Taylor, W. A. Barnes, L. H. Marlor, R. Povey, and W. Tuke Robson, who will see to it that the entertainment will be maintained at the same high standard as in previous years. An interesting feature of the meetings is the inter-visitation with the Liverpool Electro-Harmonic Society, which has now become an annual event; this will take place at the December meeting, which will take the form of a hot-pot supper and concert. A ladies' evening is to be held on February 2nd. The Committee appeals to all engaged in the electrical and allied trades in the Manchester district to join the Society and take full advantage of the opportunities it affords for social intercourse with those similarly employed. Mr. J. A. Robertson, M.I.E.E., has again consented to be president of the Society, and Messrs. C. E. Leak and L. H. Marlor respectively fill the offices of hon secretary and treasurer.

A.C. Commutator Motors.

The Development of the Vector Diagram of the single-phase compensated Repulsion Motor.

By W. FORD, Wh.Sc., A.C.G.I., B.Sc., D.I.C.

A THOROUGH course in the theory and application of the polyphase induction motor is a conventional part of the training of the young electrical engineer, and nearly all students and engineers are, or have been, familiar with the famous circle diagram and the mass of information which can be deduced about the performance of an induction motor by the carrying-out of two simple tests and the drawing of a few straight lines and one circle. Electrical engineering owes a great debt to the ingeneous inventor of the circle diagram for what is the most widely used a.c. motor. Induction and synchronous motors are inherently constant-speed machines and hence are practically useless for crane and traction work. For traction, beyond a certain distance, direct current is uneconomical because of transmission losses, so that modern practice is to transmit power as h.p. alternating current and convert it to d.c. at the required voltage at sub-stations. With heavy traffic the cost of sub-stations is large, so that the problem of using the a.c. at high pressure was considered. Induction motors were first used, but they were uneconomical for starting and were bad for urban and suburban work.

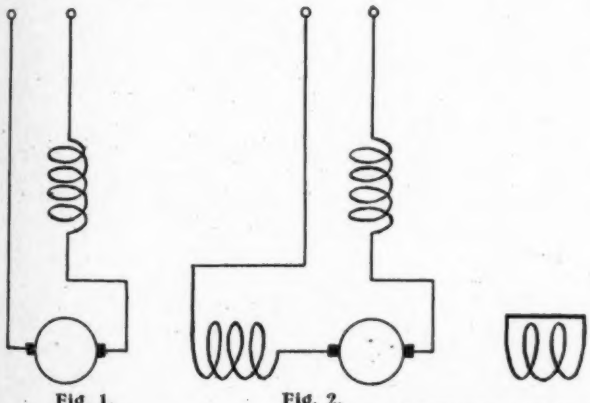


Fig. 1. D.C. Series Motor.

Fig. 2. A.C. Compensated Series Motor.

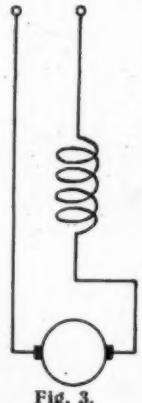


Fig. 3.

The single-phase a.c. commutator motor is, however, almost essential for many purposes, and is extensively used as a traction machine. It has the same characteristics of operation as the d.c. series motor, and starting is by transformer tappings; hence there is no waste in control resistance. Lectures on the subject of these motors are usually delivered hurriedly at the end of the ordinary college diploma course in electrical engineering, and unless a student is able to take a special post-graduate course in electric traction, or unless he is directly concerned with the subject on leaving college, he has little chance of getting to know this extremely interesting class of electric motor. A.c. traction systems invariably use commutator motors, and the development of the single-phase commutator motor is one of the most romantic episodes in the history of electrical engineering. The majority of the so-called standard text-books on electrical engineering either ignore the a.c. commutator motor or treat it in a very scrappy manner, and in very few books is any information on the vector diagram supplied.

It is quite common for small series-wound fan motors to be run on either d.c. or a.c., and such motors will operate very successfully on both systems of supply. In a d.c. series motor the current flows through field windings and an armature. A flux is produced in the field poles which links the armature windings, and the interaction of armature and field fluxes produces rotation. Now, suppose the same motor to be fed from an a.c. supply; the current direction is changed in every cycle. In each cycle, therefore, field flux and armature current are both reversed, and hence it is obvious that the torque on the armature produced by their interaction is not changed in direction, but becomes instead a unidirectional pulsating torque. For larger machines, running on a.c. supply presents difficulties if the winding arrangement is of the d.c. series type. The motor operates at low power factor, takes excessive current from the mains, and there is heavy sparking at the commutator. This sparking is due to the fact that the armature coils short-circuited by the brushes link the pulsating flux induced in the field poles, and hence an e.m.f. is produced in the short-circuited coil, giving rise to large circulating currents which must pass through the brush tips. To overcome this difficulty the ordinary d.c. traction motor design was modified in three ways. The armature turns-per-coil were reduced, the main flux reduced, and a "compensating winding" added to the stator. This winding carried the series current and was arranged so that its distribution was the exact opposite to the current distribution in the armature. The diagram of connections for a d.c. series motor is shown in fig. 1, and for an a.c. compensated series motor in fig. 2; these and subsequent diagrams of connections represent a two-pole motor. The compensating winding and the armature winding act as the primary and secondary of a transformer, and hence practically wipe out each other's induced fluxes, and rotation is produced, as in a d.c. series motor, by the interaction of the exciting flux and the armature current. Since the compensating winding and armature winding constitute the primary and secondary of a transformer, the compensating current will still be induced if the compensating winding is disconnected from the supply circuit and short circuited, as shown in fig. 3. In this case the current in the compensating winding is produced by induction and is not the series current which also flows in the armature, but the effect is the same. The motors with connections as shown in figs. 2 and 3 are virtually the same.

The next development was the "Atkinson" motor. Since the armature and compensating windings constitute a transformer, the primary and secondary are interchangeable, and thus the compensating winding was connected in series with the exciting winding and the armature short-circuited across the "transformer" axis by brushes on the commutator, as indicated in fig. 4. The driving torque is produced by the interaction of the exciting flux and the armature current. The "Atkinson" type of motor is known as a "repulsion" motor. From this point development took two courses. The first, due to Elihu Thomson, was the combination of the compensating and the exciting windings, as indicated in fig. 5, the axis of the coil being arranged at an angle to the exciting and transformer axes as shown, so that the single stator winding produces the same effect as the two windings of the "Atkinson" motor; the flux produced by the stator can be considered as resolved into "transformer flux" and

"exciting flux" in quadrature. The great advantage afforded by the "stator-fed" motors illustrated in figs. 4 and 5 is that the only connection between stator and armature is magnetic. Hence the stator can be connected directly to a high-voltage supply and the armature can be of the ordinary low-voltage type, thus eliminating the necessity for a transformer and retaining the advantages of a low-voltage armature winding.

The second modification of the "Atkinson" motor is the incorporation of the exciting winding in the armature, since the flux in the exciting axis can be produced by a current in the armature as well as by a current in a fixed winding on the stator. The current to produce the exciting flux is fed into the armature by brushes on the exciting axis, so that there are two distinct currents flowing in the armature windings; one is the series current which produces a flux in the exciting axis, and the second is the short-circuit current in the transformer axis produced by transformer action between the armature and the compensating winding of the stator: the connections are indicated in fig. 6.

The manner in which the torque is produced in this type—the compensated repulsion motor—has been the subject of much discussion. It has been put forward that the interaction of the short-circuit current and the exciting flux produces torque, but both these quantities are in the armature; turning must be produced by the "pushing" of one body by another—definite action and reaction. The interaction between two quantities in the armature can only create stresses in the armature. It has been printed in text-books that supplying two distinct d.c. currents to an armature, supported in bearings and not surrounded by a magnetic circuit, will cause the armature to rotate, since the one current interacts with the flux produced by the other. This statement is not borne out by practical application, and attempts by the author to produce rotation in this way have proved abortive. In the compensated repulsion motor the torque is really produced by the interaction between the armature exciting flux and the reflection into the stator of the rotor short-circuit current, *i.e.*, by magnetic reaction between the movable rotor and the fixed stator.

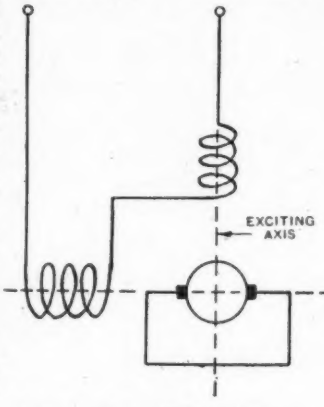


Fig. 4.—"Atkinson" Motor.

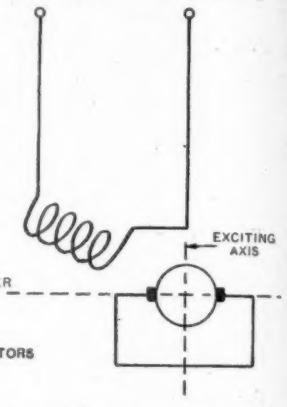


Fig. 5.—"Elihu Thomson" Motor.

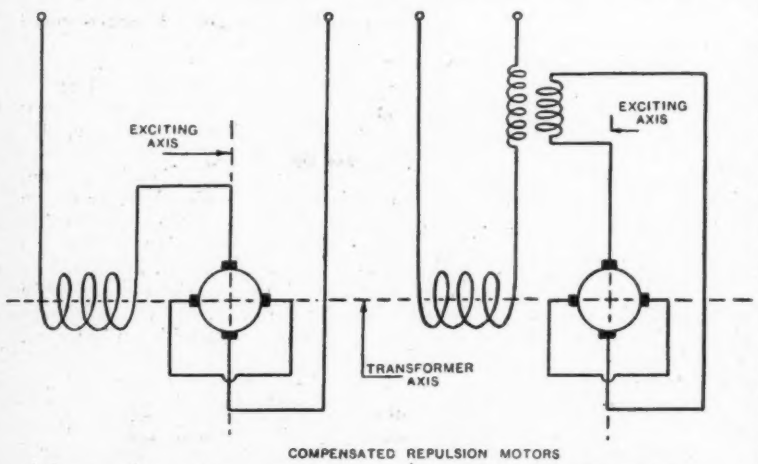


Fig. 6.—Series Repulsion Motor.

Fig. 7.—L.W.E. Motor.

To regain the advantage of the "Atkinson" motors in that the stator and rotor are electrically separate, a current transformer can be introduced, as indicated in fig. 7. The ratio may be 1:1, in which case the characteristics of the motor are unchanged, but the speed-torque curve of the motor can be varied within wide limits by varying the transformation ratio of the current transformer. This type of motor is known as the Latour-Winter-Eichburg motor, and it is extensively used for traction purposes. Thus we see one side of the development of the single-phase commutator motor. There are many other types, equally interesting, and recently there has been steady development of the polyphase commutator motor, of which, perhaps, the "Schrage" motor is the most notable.

The second part of this article is devoted to the development of the vector diagram for the compensated repulsion motor and a brief mathematical analysis of the conditions of operation. This motor probably presents the most interesting problem of any of the a.c. commutator motors, in so far as its vector diagram is concerned. Many competent authorities aver that it is not possible to construct one complete vector diagram for the motor, but that a separate diagram must be drawn for each axis. The diagram developed below, fig. 9, has, however, been justified by actual experimental work. Suppose a current I to be flowing through the transformer and exciting windings of a compensated reulsiopn motor due to the application at the terminals of a voltage v (fig. 8). In the transformer (stator compensating) winding, a part of the current is a magnetising component producing flux in the transformer axis. This flux, Φ_T, links the armature winding and produces an e.m.f., E_{pt}, across the transformer axis of the armature. This axis is short-circuited by the brushes, and a current I_{at} flows in the armature. The reflection of I_{at} in the stator is I'_{at}, and the difference between I and I'_{at} is the stator magnetising current. In the exciting winding, however, the whole of the current I produces m.m.f., and since there is no opposing effect, all this m.m.f. produces the exciting flux Φ_E. It is the interaction of Φ_E and I'_{at} which produces the torque to drive the motor. When the motor is running, the armature conductors cut both Φ_T and Φ_E, producing e.m.f.'s of rotation in each of the axes. E_{rt} is produced by the armature conductors cutting Φ_E, and the sum of E_{rt} and E_{pt} produces the short-circuit current I_{at} in the armature. The flux Φ_E produces an e.m.f. of pulsation, E_{pe} in the exciting axis, and the rotation of the armature in Φ_T produces an e.m.f. of rotation in the same axis. Hence, it will be seen that the applied voltage v has to overcome—

(i) Resistance and reactance drops on stator and rotor.

(ii) E'_{pt}, the reflection into the stator of E_{pt} the pulsating e.m.f. in the transformer axis.

(iii) E_{pe}, the e.m.f. of pulsation in the armature exciting winding.

(iv) E_{re}, the e.m.f. of rotation in the armature exciting winding.

Consider the e.m.f.'s producing current in the transformer axis of the armature: E_{rt} depends upon Φ_E and

speed of rotation, and E_{pt} depends upon Φ_T and supply frequency. The difference between them is the impedance drop in the windings.

Let f_1 be supply frequency, f_2 the rotation frequency, T_r the number of turns on the armature, and K the winding factor $= 2/\pi$.

$$\therefore E_{rt} = 2\sqrt{2} \cdot f_r T_r \hat{\Phi}_E \cdot 10^{-8} \text{ volts}$$

$$\therefore E_{pt} = 4.44 f_1 \cdot KT_r \cdot \hat{\Phi}_T \cdot 10^{-8} \text{ volts}$$

$$= \sqrt{2}\pi \cdot f_1 \cdot 2/\pi \cdot T_r \hat{\Phi}_T \cdot 10^{-8} \text{ volts}$$

$$= 2\sqrt{2} f_1 T_r \hat{\Phi}_T 10^{-8} \text{ volts.}$$

The armature impedance drop may be considered as negligible as far as the short-circuit axis is concerned, and hence $E_{p_s} = E_{rt}$.

$$\therefore f_1 T_r \Phi_T = f_r T_r \Phi_E$$

$$\therefore \Phi_T = f_r/f_1 \cdot \Phi_E \quad \ldots \quad \ldots \quad (1)$$

At synchronous speed $f_1 = f_r$.

$$\therefore \Phi_T = \Phi_E \quad \ldots \quad \ldots \quad (11)$$

These relations between the two fluxes are most useful in developing the vector diagram. Two preliminary tests are necessary to obtain information for the vector diagram.

Since when the motor is at rest, the stator and the armature across the short-circuited brushes act as primary and secondary of a transformer, the ratio of transformation between them is determined as in the case of a single-phase transformer. The test must be carried out with the supply to the stator only, the "exciting axis" brushes being lifted and the "transformer axis" brushes open-circuited. Measurements are taken of supply voltage, primary current and watts, and also the induced voltage on the armature "transformer" axis. This test gives information as to the magnetising current of the stator and the voltage ratio (*i.e.*, ratio of turns) of stator and armature. The second test is similar, but the armature is short-circuited through an ammeter, and the test is carried out with a low-voltage a.c. supply at the normal frequency of operation of the motor. Measurements are taken of supply voltage, current and power, and of the secondary current. This test gives the current ratio between the stator and armature under normal running conditions. Suppose I is the current taken from the mains; this includes I_{mt}, the stator magnetising current, and the other component is I'_{at}, the reflection of I_{at}, the armature short-circuit current. The ratio of I_{at}, and I'_{at} is the voltage ratio as found by the first test. Hence vectorially $I_{mt} + I'_{at} = I$.

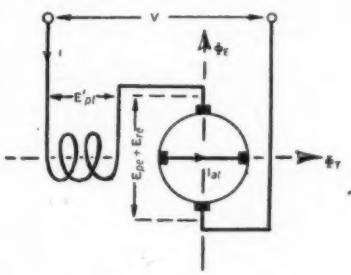


Fig. 8.—Compensated Repulsion Motor.

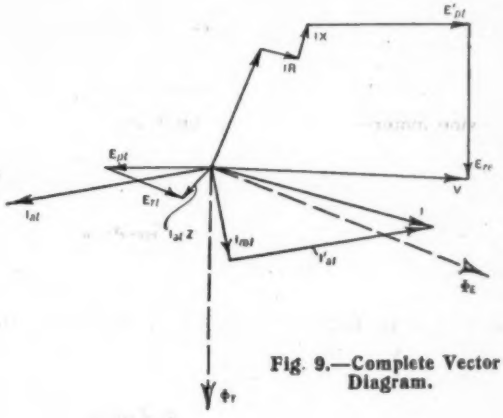


Fig. 9.—Complete Vector Diagram.

The drawing of the vector diagrams for the machine, when running, provides an interesting problem, but it is necessary to make several assumptions before they can be drawn:—

(i) All fluxes, voltages and currents are assumed to be sinusoidal quantities. This is a necessary assumption in all vector diagram construction, but in practice, pure sine waves are unusual.

(ii) Similarity of magnetic circuits of the stator and rotor; this is justifiable since the stator is smooth-bore and there are no salient poles.

(iii) Assume that the short-circuit test gives "apparent equivalent" impedance of stator and armature "transformer" windings.

(iv) Neglect effect of currents due to pulsation of Φ_E and Φ_T in coils short-circuited by the brushes; that this effect is of appreciable magnitude, however, may be deduced from the fact that in a "voltage-ratio" test in which the exciting circuit brushes were not lifted from the commutator, the brush tips got red hot.

The theoretical vector diagram for load conditions of a compensated repulsion motor is shown in fig. 9. Φ_T is the stator flux, E_{pt} the voltage induced by this flux in the armature transformer axis, and E'_{pt}, which has to be overcome by the supply voltage, is the reflection of E_{pt} into the stator. I_{mt} is the component of the load current which produces the flux Φ_T. Φ_E is the flux in the exciting axis and is produced by I, the load current. The difference between I and I_{mt}, is I'_{at}, which is the reflection into the stator of I'_{at}, the armature short-circuit current. I_{at} is produced by the resultant e.m.f. in the armature short-circuit axis, which is the sum of E_{pt} and E_{rt}, the latter being in phase with Φ_E, since it is produced at the transformer axis by rotation of the armature conductors in the exciting flux. The resultant of E_{pt} and E_{rt} is therefore the impedance drop in the armature transformer winding.

The applied voltage V has to overcome the four quantities: E'_{pt}, lagging in quadrature with Φ_T, E_{pt}, lagging in quadrature with Φ_E, E_{rt}, in phase with Φ_T, and impedance drops in series circuit.

These quantities are set out in the diagram, fig. 9, which shows the time relationship between the quantities. The two fluxes are in quadrature in space-phase, but are not necessarily in quadrature in time-phase. When the machine is running at synchronous speed and the two fluxes are equal, they are in quadrature in both time and space phase and, hence, there is a purely rotating field.

In order to illustrate the construction of the vector diagram, the conditions at synchronous speed of a particular motor will be considered. The motor tested was an A.E.G. 10-h.p. traction motor, taking supply at 250 volts and 25 cycles per sec. It was a four-pole machine, the synchronous speed being 750 r.p.m.

The test results were: Load current (I) 42.5 A, voltage across stator 240, voltage across armature exciting axis 36, power factor 0.95 ($\cos\phi = 0.95 \therefore \phi = 18°$).

The results of preliminary tests were: stator-armature voltage ratio 0.443, stator-armature current ratio 2.04, resistance of stator 0.135 ohm, resistance of armature across transformer axis 0.888 ohm, and resistance of armature across exciting axis 0.068 ohm.

The equivalent resistance of stator and armature across the transformer axis, referred to supply circuit $= 0.135 + (1/0.443)^2 \times 0.088 = 0.605$ ohm.

The equivalent impedance, as computed from current ratio test $= 1.5$ ohms. Impedance drop $= 42.5 \times 1.5 = 63.7$ volts: of this, resistance drop $= 42.5 \times 0.605 = 25.5$ volts.

Assume, as a first approximation, that the resistance drop is in phase with the voltage in the stator. Hence (fig. 10) subtract, vectorially, the impedance drop and get the e.m.f. of pulsation in the stator, E'_{pt}. Set off Φ_T leading E'_{pt} in quadrature. The value and power factor of I_{mt} can be found from the result of the voltage-ratio test, when the value of E'_{pt} is found, and hence

I_{mt} can be drawn in. Now, the line current, 42.5 A, flowing in the exciting circuit produces the same m.m.f. as 0.443×42.5 A $= 18.8$ A in the stator winding, which produces an e.m.f. of 250 volts, as deduced from the voltage-ratio test.

Hence, the e.m.f. due to 42.5 A in the exciting circuit is $250 \times 0.443 = 111$ volts; this is E_{po}.

At synchronous speed, $E_{po} = E_{ro}$ since $\Phi_E = \Phi_T$ and $f_1 = f_r$.

$\therefore E_{ro} = 111$ volts.

To the vector representing the stator voltage add the impedance drop of the armature exciting winding,

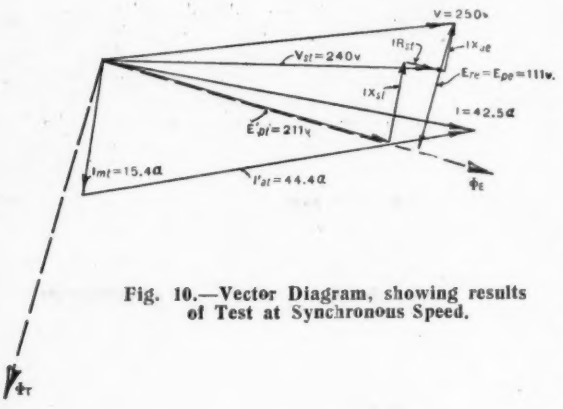


Fig. 10.—Vector Diagram, showing results of Test at Synchronous Speed.

IZ_{ae}: impedance $= 36/42.5 = 0.85$ ohm; resistance, as measured $= 0.068$ ohm. The voltage across the armature exciting axis is the impedance drop in this winding, *i.e.*, 36 volts. Add to this E_{ro} in phase with Φ_r. Now, the remaining vectors to close the polygon are known in magnitude, and hence can be fixed, since $E_{po} = 111$ V, and the supply voltage $v = 250$ volts. Having fixed E_{po} in direction, Φ_E can be drawn leading in quadrature. Since Φ_E is produced by the load current I, I lags on Φ_E, the angle between them being assumed to be the same as that between I_{mt} and Φ_T, since the stator and rotor are assumed to have same magnetic characteristics. Hence I can be drawn and I'_{at} completes the triangle of currents. When this diagram is drawn, it will be seen that the assumed resistance drops are not in phase with I, and an adjusted diagram has to be drawn to get agreement between the directions of the I and IR vectors. (Fig. 10 has been so adjusted.)

There are two checks on the adjusted diagram. In this case the angle between I and v obtained by construction was 18°, thus giving agreement between the vector diagram and the test result. $I'_{at} = (\text{current ratio} \times I_{at})$; from vector diagram $I'_{at} = 44.4$ A. $\therefore I_{at} = 44.4 \times 2.04$ A $= 90.5$ A. From test, $I_{at} = 91.8$ A.

Hence, it will be seen that the diagram, as drawn, fairly represents the performance of the motor at synchronous speed, but the further problem is to predict the performance of the motor over its whole range of operation by using this diagram. We know that

E_{ro} depends upon speed and Φ_T,
E_{po} depends upon Φ_E, and
E_{pt} depends upon Φ.

The relation between Φ_E and Φ_T and speed is given by formula (1), but this is not true over the whole of the range, since if the speed is zero, $f_r = 0$, and hence Φ_r is zero, according to the formula. As, if the motor were stalled, the current taken would be large, it cannot be agreed that no part of that current would produce flux in the stator. But the relation given in the formula (1) is approximately true over the normal speed range of the motor.

The author was unable to continue further the research into the problem of the graphical prediction of the performance of the compensated repulsion motor, but feels that a fairly simple method can be evolved. The person who manages to invent a graphical method of analysis for these motors will deserve the gratitude of electrical engineers, but extensive research on motors of all sizes will be necessary before any method can be justified. The greatest difficulty is the fact that the resultant flux (Φ_T and Φ_E do not, of course, exist separately) is a combined rotating and pulsating field, and this tends to distort the current wave form. In fact, in one motor an oscillogram was taken of the short-circuit current in the transformer axis, and it was difficult to distinguish the fundamental of the wave form. Furthermore, there are considerable circulating currents in the coils short-circuited by the brushes, and these also affect the flux distribution and current wave-form.

The subject-matter above comprises about ten times the space normally devoted to all types of a.c. commutator motors in the usual standard textbooks, and yet the development and theory of only one type have been considered here. It is felt that more attention should be devoted to studying these motors as a class, since very few people outside those interested in railway traction know anything about them. For equal power and the same working characteristics, a.c. commutator motors are lighter than d.c. series motors, and they also save the cost of rotary-convertor sub-stations, since high-tension a.c. can be used directly at the motor after long-distance transmission.

Replacement of Apparatus on Changing-over.

An Important and Undecided Point is Discussed.

By W. ERIC JACKSON, LL.B., Barrister-at-Law.

THE impending changes which are in prospect in many parts of the country, whereby electricity authorities intend altering the type or pressure of current, involve a problem which seems to have escaped the notice of those who first framed the various Electricity Acts, namely, the question of the alteration or replacement of fittings and apparatus rendered necessary by the change in the voltage or type of current supplied. The electricity authorities, however, recognise their responsibility in this respect, and are usually ready to meet the claims that may be made upon them by consumers whose apparatus is rendered useless by the change, but in many parts of the country notification has been given by the authorities to the consumers that no responsibility will be taken for the conversion of radio receiving sets which take supply from the mains, and the question arises whether they can legally maintain that attitude.

A study of the numerous Electricity Acts reveals apparently nothing bearing on the point directly. The framers of the Acts had in view the possibility that improper fittings might injuriously affect the supply to other consumers, but never appears to have realised that a change-over from one type of

current to another might render useless the fittings of a consumer.

There is no doubt that an electricity authority, having once obtained powers to make the contemplated alteration, is quite entitled to do so. Indeed, the Act of 1882 states that, with the consent of the appropriate Government Department, the authorities are entitled to alter the pressure and type of supply. So far, then, the law is on the side of the authority.

Section 17 of the Electric Lighting Act of 1882 provides that in the exercise of the powers in relation to "works" given them under the Act or any Licence or Order, the undertakers shall do as little damage as may be, "and shall cause as little detriment and inconvenience as may be," and shall make full compensation to all bodies and persons for all damage sustained by them.

The Act goes on to define what are "works":—"lines, buildings, machinery, engine works, *matters or things* of whatever description required to supply electricity and to carry into effect the objects of the undertakers."

From this it is submitted that a change of current may very well be a source of claim against the undertakers. It is true that such a change is not similar in nature to the specific "works" mentioned above, but the definition is so wide as to include almost every activity of the undertakers in the exercise of their statutory powers.

Section 18 of the same Act of Parliament is of interest in this connection, and throws a further light upon this somewhat difficult question. So far as can be seen from a general survey of the law of electricity, the Section 17 quoted above has only been used as a basis for legal claims when the works of the undertakers have caused actual physical damage, as, for instance, where excavations have been necessary, or where the erection of buildings has interfered with the rights of adjoining landowners. No case appears to have arisen out of this Section for decision in Court, where a claim has been made for *damage* to fittings by undue pressure, or for the value of fittings rendered useless by a change of pressure.

Section 18 even goes so far as to say that the consumers shall be quite entitled to use whatever fittings they choose, so long as the fittings do not injuriously affect the general supply. The Section sets this out in very precise terms: "The undertakers shall not be entitled to prescribe any special form of lamp or burner to be used . . . nor in any way control or interfere with the manner in which electricity supplied by them is . . . used."

It may well be asked, Does this include radio apparatus? It is submitted that it certainly does: for the latter words of the section are wide enough to cover any form of apparatus.

As far as the law goes, then, at the present stage of our inquiry, the position is that a consumer may do what he likes with the current on his side of the house terminals, so long as he does not do anything to cause a stoppage or interruption of the general supply. The electricity authorities are quite wrong if they attempt to prevent householders from using any form of radio receiving set which does not endanger the supply.

Apparently the notices which have been sent out to consumers do not contain any suggestion of the kind, but consumers may be assured (in case they imagine that there is, behind the notices, any intention to interfere with their choice of apparatus) that electricity authorities have no power of this sort.

The authorities have power to cut off the supply to persons who persist in using fittings which upset the general system, and there is no doubt that if, after the contemplated changes have been brought into effect, the fittings of any consumer do in fact endanger the general supply, the authorities will not hesitate to use their powers in this behalf.

The point which presents the greatest difficulty in our inquiry is whether a consumer, whose fittings are quite harmless as regards the suppliers, but are not suited to the new conditions and are likely to be rendered valueless, can get compensation from the supplier.

As will be seen from what has been said above, the law gives very adequate protection to the supplier against damage to the supply by consumers' fittings, but makes no provision directly for the case of damage to the fittings by the supply. The Acts appear to be rather one-sided in this respect. One must therefore look elsewhere if any basis for compensation is to be found. In this regard the regulations made by the Electricity Commissioners are of great assistance.

Under the Electricity (Supply) Acts, 1882 to 1926, the Commissioners have power to make regulations for the ensuring of a proper supply. In the Regulations published in 1926 it is provided that the pressure at the consumer's terminals shall only be altered with the consent of the Commissioners, and upon such terms and conditions as the Commissioners shall impose.

The matter, then, seems to come to this, that the Acts of Parliament themselves give no help, but if the Commissioners like to safeguard the consumer, by imposing such terms in their consent to the alteration of current as will allow for compensation to the consumer, the Commissioners are able to do so. There is no obligation laid upon them to do this, but it appears that in practice they do safeguard the consumer by imposing a term that the supplier shall either make the alterations to the consumer's apparatus that are rendered necessary by the change-over, or they shall pay to the consumer a sum to compensate him for any loss occasioned by the change.

Now, where this condition is imposed, the consumer is safe enough. Any disobedience of it by the supplier will render him liable to action on the part of the Commissioners. It is very doubtful whether the consumer himself could sue the supplier for non-compliance with the condition, for the consumer is not a party to the arrangement between the supplier and the Commissioners. However, there is no doubt that where the Commissioners impose such a condition, the consumer should get the cost of alteration of his radio apparatus if it is worked from the mains.

Any notice by the supplier that he does not intend to recognise the claims of consumers will be of no avail, except as regards apparatus fitted *after* the receipt of the notice. Indeed, the Commissioners are careful to state this in their usual conditions. Accordingly, no radio owner can expect to get compensation for fittings put up by him since receiving notice of the change of current. The same will apply to other apparatus which takes the supplier's power from the mains.

But, as stated above, there is no fixed rule about the imposing of the condition above-mentioned. The Commissioners can use their own discretion entirely, and are in no way bound to impose any conditions at all. It is therefore necessary to examine the position where no condition as to compensation is imposed by the Commissioners. The provisions of the various Electricity Acts are most unsatisfactory in this respect, as will be seen from a short consideration of their wording.

In Section 28 of the Electric Lighting (Clauses) Act of 1899 it is provided that if a consumer demands a greater maximum of pressure than is generally supplied by the electricity authority, the authority may claim compensation from the consumer for any expenses involved in changing the supplier's apparatus. Here, again, we have an example of the one-sidedness of the Acts. This may be due to lack of imagination on the part of those who drafted the Acts, but it seems hardly possible that when the framers of the statute had in view the possibility of expenses being incurred by the suppliers by a change of current demanded by the consumer, they should have overlooked the possibility of expense to the consumer incurred by a change of current demanded by the supplier.

All this becomes of interest when we return to the consideration of Clause 17 of the Act of 1882

which is referred to at the opening of this discussion. In the interpretation of statutes, the Courts usually look to the whole of the statute and interpret its clauses by what is known as the "*ejusdem generis*" rule. Section 17 states that compensation may be claimed from undertakers for any damage done by "works," and "works" are defined as set out above. The point to consider is whether the words "matters or things of whatever description" are to be understood in their ordinary sense, or whether they are to be read in connection with what goes before. If the former, then a change of current would undoubtedly come within the matters which would give rise to compensation. If not, then the words must be read according to the "*ejusdem generis*" rule, and "matters or things" means matters or things of the same kind as those referred to in the preceding lines of the section, namely, "lines, buildings, machinery, engine works." Now, this is the rule which the Courts usually adopt unless the definition is unusually wide. To get at the principle which the Courts would apply in interpreting the exact meaning of the present definition, one would have to go into similar cases of definitions in other statutes. This would be too technical a legal inquiry to interest readers here, but the view is submitted that the definition is wide enough to cover *damage* caused by a change of current, and possibly also loss due to the unsuitability of old apparatus for the new pressure.

On the other hand, the Courts usually come to the conclusion, in reading modern Acts of Parliament, that if anything is left out, then Parliament did not intend to give any redress. In view of the fact that the possibility of *damage* to the suppliers' fittings by a change of current demanded by the consumer is dealt with in the Acts, it might very well be said that Parliament did not intend that consumers should have any redress against the suppliers for *damage* or loss caused by a change of current demanded by the suppliers.

The point is a difficult one, and may give rise to a leading case in the very near future, for it is evident that numerous cases of the kind will arise when a change-over takes place, and both consumers and suppliers will need to have an authoritative statement of the law from the judges.

The only straw which the consumer can clutch in order to establish a case for compensation is the wording of the definition in Section 17 of the 1882 Act. The contention that this is wide enough to cover the present case will be met with the "*ejusdem generis*" rule, whereby general words in a definition are limited to things of the same kind as those particularly specified in the previous lines of the Section. And again there is the principle adopted frequently by the Courts, that what is left out is not intended to be legislated for.

Between these two opposing arguments the final decision will rest. One cannot speak with authority, but merely express a humble opinion. There is no doubt that electricity suppliers are conscious of the possibility of claims, and wish to put themselves on the safe side by the issue of notices to consumers. But such notices will be of no avail if in fact there is a good legal ground for compensation. If the authorities are liable, they will not escape by the issue of notices, and if there is found to be no liability, the issue of notices will constitute no more than an act of common courtesy on the part of the suppliers.

The matter must rest in this state of indecision until some public-spirited consumer sees fit to contest the matter and obtain a definite ruling. At the moment one can do no more than open one's eyes to the contentions for and against, and, if possible, come to some amicable arrangement with the opposing party, supplier or consumer, as the case may be.

Happily, one is able to hope that in the great majority of cases there will be no need to appeal to the Courts for a decision, for doubtless the Commissioners will impose the condition as to compensation. Where such is the case, no dispute on a matter of principle will arise, the only cause of contention, then, being the actual amount of compensation to be paid. And such disputes as these the Commissioners provide for by making a condition that they shall be settled by arbitration, thus providing a cheaper and speedier mode of disposing of the matter than an appeal to the Courts.

The Factory Lighting Campaign.

Conferences in London and the Provinces.

On October 5th conferences in connection with the Factory and Workshop Lighting Campaign were held in London, Manchester, Leeds, Glasgow, Newcastle, and Birmingham. At each of these a paper prepared by Mr. W. J. Jones, of the Lighting Service Bureau, was read and discussed. The same paper is to be presented at further conferences as follows: To-day (Friday) at Bristol; October 22nd at Cardiff; and October 26th at Edinburgh.

The following is an abstract of this paper:—

The report of the first Departmental Committee on Lighting showed the Home Office to be definitely interested in the importance of correct lighting in works. Since that report our knowledge of the fundamentals of lighting had greatly expanded, and practical lighting data had been obtained. We no longer thought in terms of the minimum amount of illumination necessary to render objects visible, but in intensities of illumination which could definitely bring about increased working facilities and safety. The following extract from this year's report by the Chief Inspector of Factories and Workshops showed that the question of lighting and illumination was given due prominence:—"Within recent years factory lighting has come to be recognised as a very important section of industrial hygiene and the large amount of investigation and experiment that has taken place has established clearly that good lighting has a marked influence both on the safety, health and comfort of the worker, and on the ease and efficiency with which the work can be done."

The present Campaign, which was being taken up so enthusiastically by all sections of the electrical industry, represented the culmination of a long series of investigations extending over a number of years; the facts given in connection with the campaign were largely based upon official reports. The manufacturers of lighting appliances had actively disseminated lighting data, and there were signs that their work was commencing to bear fruit in a general appreciation on the part of factory executives and employés of the value of better lighting.

As in previous lighting campaigns, the E.L.M.A. Lighting Service Bureau considered it necessary to make a survey of the lighting conditions obtaining in this particular field, and consequently Mr. J. L. H. Cooper during last autumn and spring conducted an extensive investigation with special reference to the engineering industries, and presented the results of his investigations in the form of a paper read before the Illuminating Engineering Society.* Mr. Cooper visited many works, and found that the majority of employers agreed that inadequate lighting was a handicap to the worker, and noted the general willingness on the part of employers to meet the wishes of workmen in lighting matters. He showed that 70 per cent. of our factories and workshops were inadequately lighted. It was evident from the results of the survey that factory lighting offered a very large field for development, and that very little had been done up to the present to exploit that particular market.

A study of the subject would show that lighting represented an investment which would lead to increased production, better work, less spoilage, improved working conditions, and fewer accidents. The additional cost of modern high-intensity lighting could be easily met if an increase in production of some 1 per cent. could be obtained as the result of the better lighting. Production tests on various manufacturing processes showed that the required increase in production was obtained many times over. Even though the work might be largely automatic, good lighting would maintain output at a high level; and there would be fewer stoppages, and closer attention to work. A Government Committee had carried out exhaustive tests on the speed and accuracy of composing (in printing) under different intensities, and systems of illumination, and it

* Elec. Rev., January 6th, 1928, p. 36.

was found that not only did the output increase, certainly up to 20 foot candles, but that there was at the same time a reduction in the number of errors. Those results were considered so important by the Joint Industrial Council of the Printing Trades, that it had issued a leaflet which definitely recommended that a lighting intensity of 20 foot candles should be provided to ensure maximum output and accuracy in the composing room. The paper included a chart showing that an increase of illumination from 2 to 20 foot candles brought about an increase in output of 33⅓ per cent., while the value of the increased production was sufficient to provide the extra light 20 times over. In practice, the value of the increased output was very much greater than this amount, due to the reduction of overhead charges, &c., while the actual cost of the lighting was an almost insignificant percentage of the total works cost. The cost of providing poor lighting worked out at an average of ½d. per day per worker, while that of providing good lighting was about ¼d. per day per worker.

The Home Office had found that the majority of accidents occurred in the winter months and that the accident rate by night on account of defective lighting was much greater than by day. Although there might be other contributory causes of the greater frequency of accidents during winter, it appeared certain that the poor artificial lighting conditions which prevailed in factories were a major cause. Good lighting undoubtedly represented a safeguard of first importance. Accidents constituted one of the hidden expenses of industry, for apart from personal injury, there was the loss due to the disablement of skilled workers and the consequent disorganisation of shop routine. Again, faulty vision involved a strain upon the muscles and the nervous system, affected the general health of the worker and reduced his capacity for all kinds of fine work.

While the recent survey indicated that only 30 per cent. of the works visited employed modern equipment, nearly half of those were inadequately lighted. Seventy per cent. of the factories required entirely re-equipping, while a further 14 per cent. required additional lighting equipment. Thus there was a large market for electrical equipment; more work for contractors; and scope for a greater sale of electricity by supply undertakings.

The Campaign had been planned by the E.L.M.A. Lighting Service Bureau and was being conducted by the British Electrical Development Association with the assistance of all sections of the electrical industry, and would continue until the end of November. It represented a co-operative effort by the E.L.M.A., the Cable Makers' Association, the Electric Light Fittings Association (Industrial Section), the Electrical Contractors' Association, and the British Electrical Development Association. Details of the campaign had been circulated to the electrical industry, and an important booklet entitled "Factory Lighting Facts for Electrical Salesmen" had been produced and should be in the hands of all electrical salesmen throughout the country. The booklet contained information, based on factory lighting data obtained from official sources, which should prove an invaluable help to salesmen in selling better industrial lighting. A standard campaign specification had been circulated throughout the industry and would also be sent to the factories and workshops on the mailing list. From the replies received to the communications which were being sent out a follow-up list was being compiled. Where inquiries gave the name of the usual electrical contractor or supplier, the contractor or supplier was being requested to follow up the inquiry at an early date. Where these names were not given a list was being forwarded to the secretaries of the E.D.A. Area Committees with the request that it should be prominently displayed so as to be available for reference by members of E.D.A. Circles and electrical interests. The list was also being sent to the supply authority concerned and to the offices of the participating associations. It was anticipated that in this way inquiries would receive attention, but to ensure that that was the case the E.D.A. was sending a follow-up letter to inquirers, after three weeks had elapsed, asking whether they had received all the information and assistance required. The ways in which electrical men could take part in the Campaign were outlined. These included the organisation of exhibitions and lecture demonstrations, personal calls, showroom window displays and demonstrations, and the fitting up of trial installations. It was desirable that many additional Circles should be formed, and each Circle was asked to organise a lecture demonstration to which factory owners and officials should be invited, as well as everyone connected with the industry. The E.D.A. had a panel of lecturers whose services were available on request. Interest in factory lighting could be stimulated by arranging industrial lighting demonstrations in showrooms. These should, wherever possible, include facilities to contrast good and bad lighting.

The Campaign had been in operation several weeks and had aroused considerable interest in the industry. As the result of the first letter issued to factory owners, nearly 800 inquiries (distributed over no fewer than 100 different undertakings) had been received for booklets and further information. A large number of Circles were actively taking part in the Campaign and had arranged lecture demonstrations to such audiences as welfare societies, factory owners, associations of works' foremen and organised groups representing specialised industries. The proprietors of small garages and workshops were just as interested in the question of better lighting as the large factory owner, and consequently there were very few districts where a lecture on industrial lighting could not be arranged. When a trial installation of modern lighting had been fitted, it was seldom taken out again; in one instance reported from the Midlands, a trial installation resulted in the complete re-lighting of the factory, involving over 400 points.

At the London Conference Mr. A. C. Cramb (chairman of E.D.A. and borough electrical engineer of Croydon) was in the chair. In opening the meeting, Mr. Cramb said the meeting had been called to consider the Campaign and to give an opportunity for explanations and information to be given in addition to the printed matter that had already been circulated. There was much to be done and no doubt the reason for the present state of affairs in many instances was that as a nation we hated change and preferred to muddle along with methods that were inefficient and expensive.

Mr. W. J. Jones then read his paper, and in a subsequent discussion Mr. Lee (Croydon) said that the whole of the sales staff at Croydon had been thoroughly educated during the summer by E.L.M.A. on lighting matters, and they all felt themselves to be experts now. Even though Croydon was very largely a residential area it had been found possible to create a great deal of interest among the factory owners as the result of using E.L.M.A. literature and methods. Already a lighting scheme was being prepared, as a result, for one fairly large factory, and this had also led to a scheme being prepared for heating that same factory. Further, a demonstration was being arranged for electrical contractors.

Mr. Gover (West Ham) said that progress could be made in shop lighting because if a shopkeeper saw a competitor with improved lighting he would copy him, but that did not apply to factories. A factory owner would adopt a scheme providing for less illumination because it cost less money.

Mr. Hodges (British Thomson-Houston Co., Ltd.), said that manufacturers of electrical appliances for factory lighting were always willing to help salesmen in any way.

Several speakers mentioned actual experiences where the improvement of lighting more than justified itself from the point of view of decreasing accidents and improving the output. Railway stations and a large number of power houses were mentioned by another speaker as directions in which there should be a field for improved lighting. Among other suggestions put forward was the necessity for getting away from the idea of what lighting would cost "per point." It was also thought that some good would be done by addressing the workmen, through their organisations.

Mr. Jones, replying to the discussion, said that representatives of the Amalgamated Engineering Union had recently visited the E.L.M.A. Bureau; it was part of the purpose of the campaign to reach trade unions as well as employers.

At the Manchester Lighting Service Bureau, Lt.-Col. W. A. Vignoles, D.S.O., presided. He said that although it had been found that good lighting meant good work, it was astonishingly difficult to make the factory owner accept this. It was their aim first to educate the factory owner in better lighting, and then having obtained his interest, set him a standard of correct lighting to work on. From the first circular sent out, seven or eight hundred replies had been obtained, and about 200 firms had given the name of a contractor. Inquiries from the second letter up to October 3rd brought the total to nearly 1,700, which they considered quite satisfactory. On the eighth of the month they intended to circulate a supplement devoted to factory lighting which had been published in the *Illustrated London News*. It was hoped that those letters which did not produce replies were not wasted, as they would have an educational effect.

Mr. R. C. Hawkins, organising officer for the area, said that successful lectures had been given at Blackburn and Rawtenstall and others would shortly be given at Warrington, Lancaster, Leigh, Liverpool, and Birkenhead. He then proceeded to deal with the methods of conducting the campaign, and illustrated some of his points by lighting the room in the old manner, with a glaring central light, and in an up-to-date way with B.E.S.A. dispersive reflectors.

In a brief discussion which followed, Mr. H. C. Lamb said that factory lighting would pay very well when the standard was raised, as had been the case with street lighting.

Mr. Hawkins said that he had arranged to give lectures to the Calico Printers' and the Bradford Dyers' Associations.

At Newcastle the speaker was Mr. H. E. Hughes, of the Scottish Lighting Service Bureau. Mr. S. E. Monkhouse, M.I.E.E., who presided, said that anything that would tend to increase output should be of extreme interest. It was well recognised that proper illumination was an important factor in the increase of output.

Mr. Hughes, in the course of his lecture, dealt with the evolution of the electric lamp and the correct way in which to employ it, with special reference to the B.E.S.A. dispersive reflector. The lecture was followed by a brief discussion.

The Glasgow conference was held in the Christian Institute, Bothwell Street. Mr. D. Macfarlane Macleod presided, and introduced the speaker, Mr. E. S Evans, of the Newcastle Lighting Service Bureau. The chairman said that they did not always realise the debt which they owed to the Electrical Development Association, which carried on its work in a very unobtrusive way while those who were engaged in the industry reaped the benefit.

The speakers at Birmingham and Leeds were Mr. J. L. H. Cooper and Mr. V. W. Dale respectively.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A Portable Electric Pumping Set.

A striking example of the utility of the electric motor is afforded by the portable electric pumping set recently put into commission by the Wakefield Corporation for the purpose of cleaning out the sewers. The sewage system is really of the inverted-siphon type, and solid matter accumulates in the bottom of the siphons. It is to remove the solid material that the pump set has been adopted. The accompanying illustration, fig. 1, which shows the outfit at work, will convey to the reader some idea of the novel arrangement and the compactness of the equipment. The generating set consists of a Petter 16-h.p., 1,500-r.p.m. oil engine directly coupled to a 10-kW, 220/230-V, protected-type, over-compounded dynamo, the complete set being mounted on a combination bedplate. A specially constructed switchboard made by the Igranic Electric Co., Ltd., Bedford, controls the dynamo and the motor. As the length of cable between the switchboard and the motor is variable, according to the depth at which the pump has to work, a cable winch with 35 feet of three-core armoured cable is provided for controlling the length of cable required at any time. This winch, which was supplied by Messrs. Green & Smith, Ltd., Leeds, is fitted with a pawl and ratchet, and three slip-rings for making the connection between the motor and the switchboard, the actual connections at the motor and switchboard being made by iron-clad three-pin plugs and sockets. The pump unit, which is suspended from a Herbert Morris pulley-block, consists of a 10-h.p., 220-V, 900-r.p.m., vertical-spindle, pipe-ventilated, drip-proof, compound-

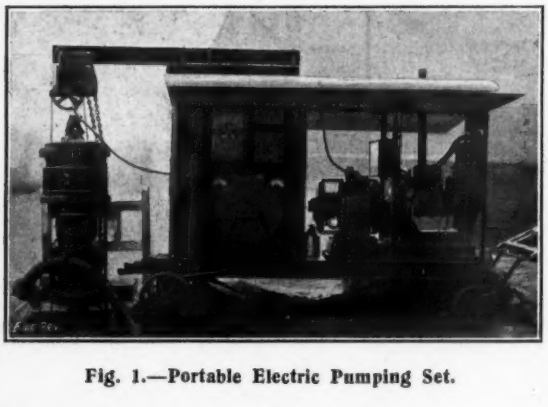


Fig. 1.—Portable Electric Pumping Set.

wound d.c. motor, driving a 3-in. " Unchokeable " pump made by Messrs. Blackstone & Co., Ltd., Stamford. The pump is provided with suitable lengths of suction and delivery flexible hose, and the maximum output against a total head from all causes of 30 ft. is about 330 gal. per min. The dynamo also supplies current for lighting during operations. Both the dynamo and the motor were supplied by Messrs. Bruce Peebles & Co., Ltd., Edinburgh.

A New Pocket Flash Lamp.

We have received from Messrs. Attaix, Ltd., 106 & 106a, High Street, Southampton, a sample novel pocket flash-lamp, a German invention, for which they have the British patent rights. The complete outfit is smaller than an ordinary cigarette case, and is flat. The batteries, 4.5 V, are sent out separately, and have to be filled with a special solution which is supplied in tubes. This operation can be repeated several times; each filling gives the battery a new lease of life which, it is claimed, is equivalent to the life of the usual type of 4½-V battery. A special 6-V set is also supplied which is even smaller still. It is claimed that the battery will not deteriorate, however long it is kept in stock.

A New Air-gap Voltmeter.

A recent production of Messrs. Watson & Sons (Electro-Medical), Ltd., Sunic House, 43-47, Parker Street, Kingsway, W.C.2, is the " Sunic " sphere-gap voltmeter shown in fig. 2. This is designed for the accurate measurement of high voltages (peak value) and should be useful as a standard item of equipment in industrial test rooms, experimental laboratories, and so on. The instrument consists of two nickel-plated copper spheres mounted on insulating arms set at right angles. In the arms are accommodated non-inductive resistances for limiting the current which flows across the air-gap. The two main insulating arms are held at their lower extremities in cast-metal holders which are attached to the operating mechanism. The operator, by turning a handle in front of the instrument, brings the two arms, and with them the spheres, together. Immediately a spark passes across the gap between the spheres, the operator releases the handle and the gap opens out again to its maximum position. At the same time an indicating device is operated which registers the voltage at the moment when the spark takes place. The indicator remains

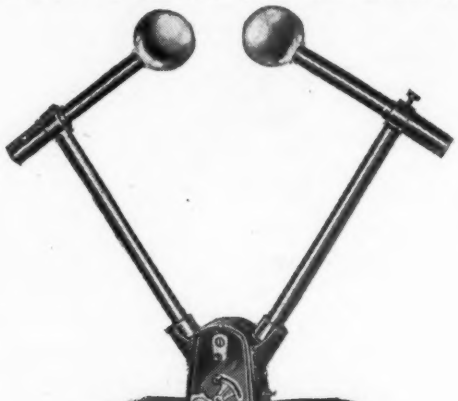


Fig. 2.—" Sunic " Sphere-Gap Voltmeter.

set until released by means of a brass knob in front of the instrument. The operating mechanism consists of a series of steel helical gears contained in a cast-brass casing which may be screwed down to a base-board or table. Rubber buffers are provided to minimise shock when the two arms drop back to their maximum position. A clamp is provided which enables the gap to be set at any predetermined value.

New " M.K." Products.

M.K. Electric, Ltd., Wakefield Street, Edmonton, N.18, has introduced an anti-flash socket, a desirable accessory for the home. It has been designed by the company to meet conditions where something is required between an ordinary plug and socket and a switch-plug. The " M.K." anti-flash socket is fitted with a simple device which instantly suppresses the arc when the plug is withdrawn, providing full security and safety to the user. Simultaneously with the withdrawal of the plug, the socket tubes are entirely concealed and isolated by automatic insulating caps. One of the sockets, fitted with a flat

Fig. 3.—The " M.K." Anti-flash Socket.

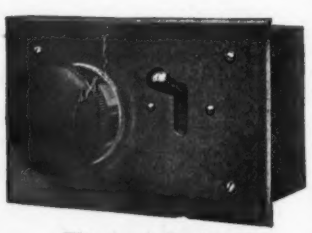


Fig. 4.—A Horizontal Interlocking Switch-plug.

bakelite plug, is shown in fig. 3. Another of the company's new lines is a three-pin horizontal interlocking switch-plug. The third pin may be used for earthing the appliance, and it also interlocks the switch so that the plug cannot be withdrawn or inserted unless the switch is " off." The switch-plug is illustrated in fig. 4.

Train Collision Report.

The recently-issued report on the official inquiry into the cause of a collision which occurred at London Bridge station on the Southern Railway on July 9th last shows that the accident occurred through the driver of a light engine passing a shunt signal at danger. It is suggested that he was over-confident of his ability to grasp the principles of the new system of signalling.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Egyptian Domestic Market.

The American Commercial Attaché at Cairo, in reviewing the market for electrical equipment in Egypt, recently reported that although the demand for household appliances is small, the possibilities are growing slowly. At present the comparatively high cost of electricity is a decided hindrance to the development of trade in such lines. At the same time, the cheapness of labour reduces the demand for such devices as electric washing machines. Electric stoves, being more expensive to operate than oil stoves, are not popular, but there is a limited sale for electric irons.

New Offices at Leyton.

The new offices of the Borough of Leyton Electricity Department were officially opened on September 29th. The Mayor, Ald. W. Bulgin, J.P., presided at the opening ceremony. Mr. J. H. Jacques, the architect, described the new premises, which he said had been completely re-designed to bring them into line with modern requirements. Mr. Jacques presented Ald. W. C. Russell, the chairman of the Electricity Committee, with an inscribed gold key. Mr. J. Wetherell, who has succeeded Mr. Harman Lewis as electrical engineer, said the prospects of the department were extremely bright. The volume of business showed signs of remarkable increase.

Swiss Meters for Rochdale.

At its meeting on October 4th the Rochdale Town Council considered a recommendation of the Electricity Commitee that a number of Swiss electricity meters should be purchased for the Department. The chairman of the Committee explained that the quotation of the Swiss makers was £2,745, while the lowest tender received from an English firm was £4,275. A representative of the latter firm had been interviewed, but he could only reduce the tender by £150. The Department's manager had stated that the Swiss meters were satisfactory in every way.

Alderman H. Clark moved an amendment to refer the recommendation back to the Committee. He said that in spite of the difference in prices, the English meter was the wiser purchase. The amendment was rejected by 34 votes to 8, and the Commitee's recommendation was approved.

Vacuum Cleaners for Italy.

In the opinion of the Canadian Trade Commissioner at Milan, it would be possible to introduce electric vacuum cleaners of new types into Italy if pushed by energetic representatives, backed by good but not necessarily expensive advertising. Competition, however, is keen. It is estimated that approximately 65 per cent. of Italian homes are electrically wired. Regarding the rapid spread of electricity in Italy, little needs to be said. At present, however, the cost is high, and while labour continues cheap, electric household appliances do not seem likely to come into anything like general use. The Trade Commissioner says:—

"Electric vacuum cleaners of domestic manufacture are not up to the standard of the foreign machines on the market. American, German, French and British machines, some of which are widely advertised, have been in this market for a long time and are well known. No Canadian electric vacuum cleaners are being imported. The number of electric vacuum cleaners imported into Italy in the course of 1927 is estimated at 15,000, as compared with 100,000 in 1926 and 60,000 in 1925. No immediate increase in imports is probable; several Italian firms have ceased importing, and competition is keen. Only machines with the latest improvements and equipment are of interest to this market.

"Foreign firms are generally represented by retailers, who either restrict themselves to selling or who, besides selling, let for a nominal charge some of the machines they carry in stock, furnishing the operators; a great many housewives, even in the wealthy class, prefer this to buying. The house-to-house method with demonstrations on the premises is the best sales method. Attractive window displays are made by retailers and demonstrations are given. Newspaper advertising is extensively used, and illustrated booklets and folders are sent through the mail to prospective buyers. Poster advertising is said to be effective. Machines are generally sold on the instalment system. Retail prices for Italian electric vacuum cleaners range from $30 to $65, while those of foreign makes run from $30 to $70. Import duties amount to approximately $15, and there is a transmission tax of 1 per cent. *ad valorem* in addition.

"Foreign firms extend payment facilities to their representatives. In the case of Italian concerns who simply handle them, machines are as a rule sent on consignment, and long-date terms are accorded those who make it a practice to let their machines. No Italian firms, as far as can be ascertained, buy electric vacuum cleaners outright, and distribute them for their own account throughout the country. They will sell only on a commission basis."

Bolivian Electrical Imports.

The Bolivian Government has recently issued statistics of the county's foreign trade in 1926. From these the following figures relating to the imports of electrical material have been extracted, the comparative figures for 1925 being added and notes of any increases or decreases given:—

	1925.	1926.	Inc. or dec.
	(Values in 1,000 bolivianos.)		
Total	1,005	1,194	+189
From United States ...	390	653	+263
,, Great Britain ...	105	142	+ 37
,, Germany	315	133	−182
,, Switzerland ...	7	95	+ 88
,, Sweden	22	57	+ 35
,, France	28	45	+ 17
,, Chile	88	44	− 44
Telegraph and telephone apparatus—			
Total	94	178	+ 84
From Great Britain ...	3	61	+ 58
,, United States ...	20	41	+ 21
,, Germany	20	14	− 6
,, France	12	23	+ 11
,, Chile	31	18	− 13
Electric lamps—			
Total	110	90	− 20
From Germany	47	37	− 10
,, United States ...	10	21	+ 11
,, Holland	12	11	− 1
,, Great Britain ...	3	3	—

[£1=12¼ bol.]

The E.D.A. 1928-29 Conferences.

The following is a complete list of conferences organised by the British Electrical Development Association for electrical salesmen and others for the 1928-29 season:—October 19th (chairman, Mr. C. H. Cox, Edison Swan Electric Co., Ltd.), "Organising for Better Selling in Electrical Showrooms," by Mr. W. Millner, B.Sc. (Westminster Electric Supply Corporation); November 16th (chairman, Mr. J. W. Beauchamp), "Modern Lighting Designs for Domestic and Business Interiors," by Mr. H. T. Young (Troughton & Young); December 21st (chairman, Mr. A. F. Harrison, City of London Electric Lighting Co., Ltd.), "Hire and Hire-Purchase in Electrical Development Schemes," by Mr. J. E. Tapper (electrical engineer of Beckenham); January 18th, 1929 (chairman, Capt. J. M. Donaldson, North Metropolitan E.P.S. Co.), "Electric Heating and Cooking Developments," by Mr. C. H. Rayner (sales manager, Manchester Electricity Department); February 15th (chairman, Mr. F. W. Purse, borough electrical engineer, West Ham), "Organising for Increased Sales—Spring-Cleaning Season, 1929," by Mr. H. W. Roberts (General Electric Co., Ltd.); March 15th (chairman, Mr. P. F. Crinks, Metro-Vick Supplies, Ltd.), "Water Heating Developments," by Mr. M. O. F. England (Benham & Sons, Ltd.).

Wages in the Contracting Industry.

Members of the National Federated Electrical Association have been notified that the existing rates of wages in the electrical contracting industry will be maintained until the period covered by the first pay day in February, 1929. These rates are as follows: Grade A, 1s. 9½d. per hour; Grade B, 1s. 7½d.; Grade C, 1s. 6d.; and Grade D, 1s. 4½d.

Australian Duties Deferred.

The import duty upon electric household dish-washing machines which was to have been put into force by the Commonwealth Government on October 1st has been further postponed until April 1st, 1929.

Bankruptcy Proceedings.

A. H. Crump, lately trading as the Selwin Electrical Engineering Co., Walworth Road, S.E.—The statement of affairs filed by this debtor shows unsecured liabilities of £733 and assets of £117. The following are creditors:—

	£		£
Crump, F.	250	S.D.H., Ltd.	24
Gottlieb & Co., Ltd. ...	28	Sunlight Mfg. Co. ...	62
Borough of Southwark ...	23	Telephone Berliner, Ltd.	22
Lithanode Co., Ltd. ...	30	Vulco Co., Ltd.	20
Metalite, Ltd.	47	J. Francis	38

S. Perkins, 1, Lodge Lane, Beeston, Leeds, wireless dealer.—The receiving order herein was made recently on debtor's own petition; the first meeting was held recently at the Official Receiver's Office, Leeds, when the case, being a summary one, was left in the hands of the Official Receiver. According to the statement of affairs there were liabilities amounting to £425, against assets of £126. The following are creditors:—

	£		£
Armstrong Siddeley Motors, Ltd.	20	Langham Radio	45
Brandes, Ltd.	85	Bankers	65
Feather & Co., Ltd. ...	32	Martindale, H. R., Ltd.	50

William Worsnip, formerly wireless dealer, 36, Market Hall, Walham Green, S.W.—The public examination of this debtor was held on October 2nd, before Mr. Registrar Mellor, at the London Bankruptcy Court, the accounts showing liabilities of £427, against assets of 12s. 6d. In reply to Mr. V. Armstrong, Assistant Official Receiver, the debtor stated that from December, 1923, until April, 1924, he managed a retail wireless accessories business at Walham Green, and received 50 per cent. of the profits for his services. In May, 1924, he rented 36, Market Hall, and, with a borrowed capital of £50, commenced a similar business in his own name, but it was not successful, and in April, 1928, having been given notice to quit the premises, he sold the stock and fixtures for £120, and closed the business. Lack of capital and bad trade were the causes of the failure. The examination was concluded. The creditors include:—

Brown Bros., Ltd. ... £128 Sun Electrical Co., Ltd. £36

J. Littler, electrical and radio engineer, 5, Lansdowne Road, late of 9, Hoghton Street, Southport, Lancs.—The public examination of this debtor was held on October 2nd, at Liverpool, when the hearing was adjourned. Debtor said that some years ago he acquired about 1,000 shares in a cotton mill at a price of 2s. each. All of those shares were only partly paid. He paid £115 in respect of calls, and there still remained a liability of about £400 on them. In March, 1926, he acquired an electrical and radio business for £400, and, owing to severe depression in trade, his position became worse. The liabilities amounted to £1,505, against assets estimated to produce £802. The debtor was ordered to file more detailed accounts.

E. D. Jones, electrical engineer, Royal Sportsman Hotel, Portmadoc, Carnarvon.—The public examination of this debtor was held on September 28th, at the Court House, Portmadoc, when the hearing was adjourned. The failure was attributed to losses on contracts through under-estimating and losses on a wireless department. The deficiency returned amounted to £941.

J. A. Davies, electrical contractor, Church Street, Blaenau Festiniog, Merioneth.—The deficiency in this case amounted to £112. Debtor attributed his failure to lack of business ability and insufficient turnover, at his public examination on September 28th, at the Court House, Portmadoc. The hearing was concluded.

E. R. D. Lindsay, wireless and cycle agent, 96 & 98, Victoria Road, Aldershot.—The public examination of this debtor was held on October 2nd, at Guildford. The statement of affairs showed gross liabilities of £1,148 and a deficiency of £714. The examination was adjourned to be closed.

H. W. Beesley, High Street, Brackley, Northants., motor-cycle and wireless engineer.—Receiving order made October 3rd on debtor's own petition.

J. Cave & T. W. Bowles, trading as Taylor & Wynne, at Back 180, Green Lane, Smallheath, Birmingham, electrical engineers.—Receiving order made October 2nd on debtors' own petition.

T. Barnett, 934, Woodborough Road, Mapperley, Notts., electrical contractor.—Trustee, Mr. R. B. Rhodes, 18, Low Pavement, Nottingham, appointed October 1st.

P. L. Litton, 12, Bath Road, Exeter, plumber and electrical engineer.—Last day for receipt of proofs for dividend, October 20th. Trustee, Mr. W. R. Cocks, Official Receiver, Exeter Bank Chambers, 67, High Street, Exeter.

G. L. Harvey, 255, Hurcott Road, Kidderminster, electrical engineer.—Receiving order made September 29th, on debtor's own petition. First meeting to-day (Friday) at the Lion Hotel, Kidderminster. Public examination October 30th, at the Town Hall, Kidderminster.

C. Nicholson, 3, Lorne Terrace, East Boldon, Durham, electrical engineer.—Last day for receipt of proofs for dividend, October 20th. Trustee, Mr. W. A. Angus, Official Receiver, 14, John Street, Sunderland.

Excel Radio Components, manufacturers of wireless sets and components, 53, Abingdon Street, Northampton.—First meeting held October 9th, at the Official Receiver's Office, The Parade, Northampton. Public examination, November 2nd, at the County Hall, Northampton.

G. S. Hall (G. S. Hall & Co.), electrical engineer, 8 & 55, Malden Road, New Malden.—Application for discharge to be heard November 2nd, at 1, Carey Street, W.C.

H. J. Hoddinott (Hoddinott & Co.), electrical fittings supplier, 3 & 5, Cathedral Yard, Manchester.—Last day for proofs for dividend, October 17th. Trustee, Mr. F. Murgatroyd, Official Receiver, Byrom Street, Manchester.

Company Liquidations.

Kye, Ltd., importers and exporters of electrical goods, Brixton Road, S.W.—The statement of affairs filed in the compulsory winding up of this company shows total liabilities of £11,314, of which £9,025 is unsecured, and assets of £1,754, with a total deficiency as regards shareholders of £18,577. The following are creditors:—

	£		£
Agazar, B. R.	485	Mellin, C., & Co.	143
Anstee, F. H.	269	Max Gloor	53
Arbon, H. J.	131	Mears & Caldwell, Ltd.	35
Arbon, Langrish & Co., Ltd.	48	Nat. Provincial Bank, Ltd.	609
Boxfoldia, Ltd.	520	Roberts, G. A.	59
Brixton Estates, Ltd. ...	141	Selco, Ltd.	743
British Oxygen Co., Ltd.	78	Scientific Metals Co., Ltd.	104
Boebtert, J. Den	27	South London Electric Supply Corporation ...	261
Bergmann Electric Co., Ltd.	23	Spicer & Pegler	130
Curzon, Hon. C. R. ...	120	Schier, A. S.	105
Durell & Co., Ltd. ...	27	Samuelson & Co., Ltd. ...	61
Eburite Paper Co., Ltd.	112	Sweeting, R., & Sons ...	44
Foster Engg. Co., Ltd. ...	25	Standard Insulator Co., Ltd.	26
Fox, C. H.	21	Swain, J., & Sons, Ltd.	23
Grainger, T. G., & Co., Ltd.	271	Vilrite, Ltd.	113
Glendale Engg. Co., Ltd.	68	Vactite Wire Co. (1919), Ltd.	80
Gisborne & Co.	20	Vereen. Fraadfabrieken	35
Hanger, Watson & Harris, Ltd.	27	Willing & Co., Ltd. ...	101
The Ironmonger	32		

Accumulators of Woking, Ltd.—Winding up voluntarily. Liquidator, Mr. H. T. Witt, 5, Chancery Lane, W.C.2, appointed October 2nd. A meeting of creditors is called for October 19th, at 5, Chancery Lane, W.C.2. Mr. H. Tansley Witt was appointed receiver and manager of the company on behalf of the debenture-holders on February 16th, 1927, and has since carried on the business. As stated under "Trade Announcements" to-day, the business has now been sold as a going concern as from May 1st last, and a new company will shortly be registered under the name of Accumulators of Woking (1928), Ltd., which will take over the works, all current contracts, &c., and carry on the business. In the meantime, as receiver, Mr. Witt is acting for the purchasers until the new company is registered. The purchase price is not sufficient to pay the first debenture holder, whose claim amounts to £8,954, and there is a second debenture debt of £11,973, which will not be paid. Under these circumstances there will be no distribution to the unsecured creditors, and the meeting will be purely a formal one.

Power Rectifiers, Ltd.—A meeting of members is called for November 6th, at Trafalgar House, Waterloo Place, to hear an account of the winding up from the liquidator, Mr. A. C. Eborall.

Electrical Contracts & Maintenance Co., Ltd.—Last day for proofs for dividend, October 17th. Mr. E. T. A. Phillips, Official Receiver and Liquidator, Carey Street, W.C.

Ansco, Ltd.—Winding up voluntarily. Liquidator, Miss C. Fletcher, 91, New Oxford Street, W.C.1, appointed September 28th. Meeting of creditors October 15th, at 27, College Street, E.C.4.

J. W. Woolnough, Ltd.—Winding up voluntarily. Liquidator, Mr. H. H. W. Perkins, Bolton Chambers, Eastbourne, appointed September 25th.

Bradninch & District Electric Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. A. A. Gates (Christy Bros. and Co., Ltd.), Broomfield Road, Chelmsford, appointed September 24th. Meeting of creditors October 15th, at the liquidator's offices. This notice is purely formal; all creditors will be paid in full.

Deed of Assignment.

G. Morrison, electrical engineer, late of 24, Birley Street, Blackpool.—Particulars of claims by October 24th, to the trustee, Mr. C. D. Harrison, 22, Birley Street, Blackpool, and 39, The Square, St. Annes-on-Sea.

Irish Radio Exhibition.

A Wireless Exhibition is being held in the Mansion House, Dublin, this week. It was opened on October 8th by Mr. M. R. Heffernan, T.D., Secretary to the Ministry for Posts and Telegraphs, whose speech on the occasion was broadcast from the exhibition. All the new season's apparatus from Olympia is being shown, and there have been crowded attendances.

The G.E.C. in Malaya.

The Kuala Lumpur branch of the General Electric Co., Ltd., had a stand of considerable dimensions at the Malayan Exhibition, held at Ipoh, in the Federated Malay States, in August, an electrical section being included for the first time. In this particular section the company secured first prize. The photograph reproduced herewith gives a good idea of the stand. The items which attracted most attention were the "Magnet Wizard" and a 45-h.p., 400-V, 3-phase, 50-cycle,

A G.E.C. Exhibit in Malaya.

slip-ring motor and switchgear; the latter was shown running, and greatly interested neighbouring miners. It is probable that there will be a big increase in the use of motors in Ipoh in the near future, as a result of the opening up by the Perak Hydro-Electric Company of one of its stations within the next two or three months. The motors will be used for driving gravel pumps in tin mines, and the usual equipment is a motor of between 45 and 180 h.p., with a controller.

Phototone Fusion Proposal.

The *Financial Times* reports that negotiations are taking place between the directors of British and French Phototone and two important electrical organisations, controlling a capital of £200,000,000, with a view to an amalgamation. The Phototone directors were approached by the directors of the two electrical organisations after a study of the Phototone process of sound synchronisation and photography over a testing period of several months.

Recent Contracts.

Five complete wireless installations for the new Court Line steamers have been ordered from the Marconi International Marine Communication Co., Ltd., by Messrs. Haldin & Co., Ltd. The equipment comprises 1½-kW transmitters, emergency transmitters and two-valve receivers. The range of this apparatus will vary according to local conditions, but transmission can normally be expected in daylight over distances of from 500 to 600 miles. The two valve receiver, consisting of three units, is able to receive messages on any wavelength within the range of 300 to 25,000 metres.

The Marking of Imported Rubber Manufactures.

The Standing Committee appointed by the Board of Trade under the Merchandise Marks Act, 1926, will hold an inquiry on November 5th and 6th, as to whether imported rubber manufactures (excluding tires and rubber boots and shoes) should bear an indication of origin. Further meetings will be held, if necessary, on November 12th and 13th. The inquiry will be held at the Board of Trade, Great George Street, S.W.1, and communications should be addressed to the secretary, Mr. E. W. Reardon, at that address.

A Visit to the Pirelli-General Works.

A party of members of the E.C.A., with central station engineers from the Cardiff, Bristol and Bath districts, recently inspected the factory of the Pirelli-General Cable Works, Ltd. (one of the associated companies of the General Electric Co., Ltd.), Southampton. The party numbered 65 in all. The visitors first went over the rubber section of the works, where various processes were inspected. Subsequently they lunched at the South-Western Hotel. Mr. G. Martinez occupied the chair, and extended a cordial welcome to the visitors. Mr. H. W. Roberts, the sales manager of the G.E.C., supported the chairman, and said that his company desired to foster the goodwill and support of members of the E.C.A., as they recognised that to give efficient service to the general public it was necessary to have in the industry a stable retailer distributing section. Mr. R. L. Booth, chairman of the Cardiff Branch of the E.C.A., expressed the visitors' thanks, and spoke of the earnest desire of the E.C.A. members to work in close touch with prominent manufacturers and electricity supply engineers. Mr. C. G. Morley New, electrical engineer of Cardiff, replied on behalf of the supply engineers, and Mr. F. Madge, secretary of the E.C.A., Cardiff, thanked Messrs. W. E. Hobbs and H. B. Duce, of the Cardiff Branch of the G.E.C., for organising the visit to Southampton. Mr. Hobbs briefly responded. After lunch the party was conveyed to Eastleigh Works, where an inspection was made of wire drawing and cable manufacturing processes. The sports grounds and social club were also visited.

Social Events.

On September 29th, five hundred employés of Messrs. Rawlings Bros., Ltd., and the Rawlplug Co., Ltd., gathered at the Kensington Town Hall to celebrate the silver wedding of Mr. J. Kirkham, joint managing director of Rawlings Bros., Ltd. An excellent musical programme was arranged by Mrs. W. Rawlings and there was a dance; Mr. W. R. Rawlings acted as chairman. During the evening Mr. and Mrs. Kirkham were presented with a silver-faced clock and an illuminated address from the employés and a silver tea and coffee service from Mr. Kirkham's fellow directors. The opportunity was also taken of presenting cheques to 126 employés with over seven years' service. Four of the workers thus rewarded had over 35 years' service to their credit. Mr. Kirkham gave an outline of the companies' voluntary "welfare" schemes. There is an endowment insurance system, and a savings scheme. There is also a "profit participating loan scheme," which gives facilities to all workers with over three years' service to place on loan with the company sums ranging from £10 to £100 at the discretion of the managing directors. The company pays 5 per cent. interest, with an additional 5 per cent. for each 1 per cent. above 5 per cent. dividend paid to the ordinary shareholders. For the first year total interest of 17½ per cent. was paid, and last year the investors received 30 per cent. Capt. Tweedie, managing director of the Rawlplug Co., Ltd., gave some particulars of that company's progress. Other presentations were made during the evening.

Members of the Birmingham Electric Club who are taking part in the Club Snooker Handicap should communicate with Mr. G. H. Westwood, 32, Newton Road, Sparkhill, Birmingham, by Wednesday, October 17th.

New Italian Companies.

Among the companies recently formed in connection with electricity supply in Italy are La Consorzio Idroelettrica Saluzzese, Saluzzo, capital 1,268,000 lire; and La Società Idroelettrica Monte Armiata, Orvieto, capital 7,000,000 lire.

For Sale.

Messrs. Goddard & Smith will sell by auction on October 16th and following days at 47a, Rectory Grove, Clapham, S.W., the stock of a Government contractor, including electrical material, &c. (See our advertisement pages to-day.)

Petters' New Factory.

A new heavy-oil engine department has been erected for Messrs. Petters, Ltd., Yeovil, and work will be provided for hundreds of extra employés. As the business continues to progress advantage will be taken of the provision for considerable extensions on three sides of the present building. The new shop will be devoted to the manufacture of large size Petter engines; its overall length is 338 ft., with two bays each 53 ft. wide. Heenan & Froude dynamometers will be used for testing the engines, and the necessary pressure will be maintained by means of a 3,000-gallon overhead tank erected on a tower about 50 ft. high over a sump with a capacity of 10,000 gall. A notable feature of the building is the system of heating by

Petters' New Heavy-Oil Engine Department.

means of circulating water from the engines installed in the main power house. The latter has been enlarged to allow for the installation of additional Petter oil engines driving electric generators to provide the extra power needed. The machine bay will be equipped with a large number of modern, electrically-driven machines, including one of the largest turret lathes in this country, and to the south of the building a gantry with two power cranes of five tons capacity will serve the core box and casting dumps. Both shops are served by an extension to the main railway siding. The building has a steel frame and is sheeted with corrugated asbestos with one length of glazing, 7 ft. 6 in. deep in the gable end. The quar-

ter pitch roof is glazed on the north side. The contract for the new building was carried out by Messrs. Braithwaite & Co., Newport. Building operations were commenced at the end of May, and the building was erected, sheeted and glazed by September 4th.

Visit to Edison Swan Cable Works.

On September 27th about 80 members of the South Wales Branch of the Association of Mining Electrical Engineers paid a visit to the works at Lydbrook of Edison Swan Cables, Ltd. The visitors assembled at Speech House, Forest of Dean, where they were welcomed by Mr. F. Gale (works manager), Mr. R. J. Morris (sales manager), and Mr. W. Elliot (South Wales representative).

Mr. T. S. Thomas (branch president) presided at the luncheon, and was supported by Mr. W. W. Hannah (branch vice-president), Mr. Dawson Thomas, Abertillery, Mr. Theodore Stretton, Mr. A. C. MacWhirter (hon. treasurer), and Mr. H. J. Norton (hon. secretary). The party was then conducted over the works, which is completely self-contained having its own rubber and wire drawing mills and tinning departments.

Members of the A.M.E.E. at the Edison Swan Cable Works.

Mr. Gale briefly explained the various types of cable manufactured, after which the party was entertained to tea. Afterwards Mr. T. S. Thomas proposed a vote of thanks to the company, and Mr. W. W. Hannah seconded it. Mr. R. J. Morris briefly replied. A photograph of the party is reproduced herewith.

Trade Announcements.

Mr. J. Irving, until recently manager of the cable department of the Greengate & Irwell Rubber Co., Ltd., and Mr. Hands, late manager of Messrs. Lindsay & Williams, Ltd., have formed a new company under the name of Rotunda, Ltd., Manchester Road, Denton, near Manchester, for the manufacture of proofed cloths and insulating materials.

A new company (Accumulators of Woking (1928), Ltd.), is being registered to take over as a going concern the business formerly carried on by Accumulators of Woking, Ltd. (in voluntary liquidation). There will be no interruption in production or in deliveries. A further reference to the company will be found under "Company Liquidations" to-day.

Mr. A. Martelli, alabaster importer, has removed from Gerrard Street to larger premises at Richmond Mews, Dean Street, W.1. He sends us a price list illustrating examples of alabaster bowls for electric lighting.

Messrs. Walter McGee & Son, Ltd., have appointed Mr. Edwin H. Judd, of Messrs. Edwin Judd & Co., Ltd., Abbey House, Victoria Street, London, S.W.1, as their London representative.

A Visit to Belling's Works.

A party of electrical contractors from Bedford and their wives and friends visited Messrs. Belling & Co.'s works recently. The visitors were conducted round the works in two parties, and were shown the various processes employed in the manufacture of "Belling" electric fires, cookers, water heaters, &c. They were afterwards entertained to tea in the "All-electric" canteen, and thanks were accorded to Messrs. Belling & Co. and to Mr. W. H. Holland, of Bedford, who was largely instrumental in organising the trip. Messrs. Belling state that they will be pleased to conduct similar parties over their works, which, they say, are now probably the largest in the country devoted exclusively to the manufacture of electric heating and cooking appliances.

Local Exhibitions.

Lincoln.—An electrical exhibition, promoted by the City Council, is to be held from October 20th to 27th. Cooking demonstrations will be given and lectures will be delivered by members of the staffs of E.D.A. and E.L.M.A.

Pendlebury, Lancs.—An electrical exhibition was held at the Town Hall from October 1st to 6th.

Dewsbury.—A Trades Exhibition, promoted last week by the Dewsbury Chamber of Trade, at the Exchange Hall, included attractive stands by Messrs. Beaumont & Blackburn, and Mr. Walter Angus, local electrical engineers and contractors. Demonstrations of electric cooking and washing were given by the Corporation Electricity Department.

Baildon (Yorks.).—The Electrical Distribution of Yorkshire, Ltd., opened an attractive exhibition of cooking, washing and other domestic electrical appliances at the Baildon Picture House on October 1st. The arrangements include an all-electric kitchen and model bathroom. The exhibition closes to-morrow (Saturday).

Unemployment.

The Ministry of Labour returns dated September 24th show that during the preceding week there was a rise of 1,540 in the number of registered unemployed. The total of 1,295,200 compares with 1,293,660 on September 17th, and 1,050,120 on September 26th, 1927.

Radio Manufacturers and the Music Trade.

Presiding on October 4th, at the autumn Trade Conference of the Music Trades Association, Mr. Charles Foulds said that radio was developing rapidly, and the instruments now made were so perfect that the music dealer should be able to handle that class of goods with confidence and profit. The wireless manufacturers were desirous of using the music trade as distributors, and the music dealers were inclined to agree that theirs was the most appropriate trade for the purpose. A lengthy statement was made regarding the aims and objects of a new trade union, to be called the "Music Merchants' Association." It was pointed out that this Association would be able to prevent the cutting of the prices of proprietary goods, and one section of the Association would comprise "manufacturers of or sole concessionaires of wireless and electrical and other scientific instruments and goods." Radio had been linked up with the gramophone in a combined instrument, and the proper channel for this, it was claimed, was the retail music trade. Mr. Mould, of the Radio Manufacturers' Association, asked whether they considered his trade a branch of the music industry. The chairman said that they hoped it soon would be. Mr. Mould said that it was a primary principle of the Radio Manufacturers' Association that each member's domestic policy should not be interfered with. But if a manufacturer fixed his prices and his discounts, and his conditions of trading, and agreed to register them with the Association, then the latter, in its character of a trade union, would assist him to see that those conditions and discounts were adhered to.

New Catalogues and Lists.

The Lisenin Wireless Co., Connaught House, 1, Edgware Road, W.2.—An illustrated price list of the company's patent terminals and other radio components, and "Halcyon" portable receiving sets.

Burovox, Ltd., Craven House, 121, Kingsway, W.C.2.—An illustrated publication dealing with the company's intercommunication telephone apparatus (including loud-speaking types) for many applications.

Siemens Electric Lamps & Supplies, Ltd., 38 & 39, Upper Thames Street, E.C.4.—Catalogue No. 400, containing fully-illustrated details and prices of "Xcel" domestic electrical appliances; and Price List No. 247, dealing with all "Association" makes of radio valves.

The Alfa-Laval Co., Ltd., 34, Grosvenor Road, S.W.1.—A leaflet dealing with the effect of fibres on the dielectric strength of insulating oils and advertising the company's centrifugal separators.

Messrs. Siemens Bros. & Co., Ltd., Woolwich, S.E.18.—Catalogue 160, Section VII, illustrating and describing the company's tee and service boxes.

Messrs. Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, E.C.1.—Catalogue No. 599, a 196-page publication containing illustrations, particulars and prices of switches, switch-plates, plugs and sockets, distribution boards, portable lamps, wiring materials, motors, suction cleaners, and a variety of other appliances and accessories.

Messrs. Veritys, Ltd., 31, King Street, Covent Garden, W.C.2.—Two export publications: No. 1058, dealing with d.c. motors and dynamos, a.c. motors, control gear, &c.; and No. 1060, describing the "Orbit" oscillating fan. The latter publication contains prices.

Messrs. John Shaw & Sons, Wolverhampton, Ltd., Wolverhampton.—Two three-colour leaflets bearing illustrations and prices of a new range of hand-painted bowls and shades for electric lighting.

Messrs. Ira Stephens, Ltd., Whitelands Leather Works, Ashton-under-Lyne.—An illustrated brochure dealing with the conveyor belt and bucket elevators, with particular reference to the company's products.

The Walker Electrical Service, Annandale Street, Edinburgh.—A list of fuse wires for use with various types and sizes of motors.

The Cook Electric Co., 2700, Southport Avenue, Chicago.—An illustrated publication dealing with telephone protection apparatus and terminals.

Messrs. Richard Garrett & Sons, Ltd., Aldwych House, Aldwych, W.C.2.—A brochure (No. 650) dealing with the company's six-wheel steam wagon.

MESSRS. C. H. PARSONS, LTD., Britannia Works, Wharfdale Road, Tyseley, Birmingham.—An illustrated and priced catalogue of "Britmac" tumbler switches, switch-plates, lampholders, and other accessories.

Calendar-blotters for October have been received from Messrs. MAVOR & COULSON, LTD., 47, Mile End, Glasgow ("Samson" coal cutter); Messrs. ARTHUR LING & Co., 138, Fetter Lane, E.C.4; and the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1 ("Atom" fire).

THE ELECTRICAL EQUIPMENT & CARBON CO., LTD., 107-111, New Oxford Street, W.C.1.—October stock list of motors, &c.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2.—Leaflet No. 134R, illustrating and describing the company's "Type 2007" loud speaker. Priced.

MESSRS. W. H. SUGDEN & CO., LTD., Glenny Road, Barking, Essex.—An illustrated and priced leaflet dealing with the "Blick" clothes-washer, dish-washer and boiler.

THE HENDON ELECTRIC LAMP CO., LTD., 104, Southampton Row, W.C.1.—A series of price lists of the company's electric lamps of various types.

MESSRS. MAWDSLEY'S, LTD., Dursley, Glos.—A leaflet illustrating examples of the company's d.c. and a.c. motors and a multi-operator arc welder.

Book Notices.

"Rating Relief Simply Explained," by J. Scott Henderson, B.Sc.(London), barrister-at-law. (Pp. 46.) London: "Rating and Income Tax." Price 3s. 6d. (cloth 4s. 6d.).—The Rating and Valuation (Apportionment) Act necessarily gives rise to the question of what is, or is not, an "industrial hereditament" for the purposes of relief. It is the aim of this book to provide an answer to this question and others which arise in the interpretation of the Act, and it appears to do this very well. A very complete index is provided, making reference a simple matter.

"Handbook for Wireless Telegraph Operators." Pp. 54; five appendixes and index. London: H.M. Stationery Office. Price 6d. net.—This book is a manual for the guidance of radiotelegraph operators on board ship (primarily) and at coast stations licensed by the P.O., with regard to the acceptance and treatment of radiograms, the transmission and receipt of signals, and other details of operation. It does not deal with principles or apparatus.

"The Electrical Contractors' Association of Scotland Year Book and Diary, 1928-29." (124 pp. and diary—two days to a page.) Edinburgh: The Association. Price 3s. net.—The new edition of this annual contains excellent portraits of the president (Mr. J. J. Foggo) and other officers of the Association. There is a record of the past year's social events and other activities and the usual features of interest and assistance to contractors.

"Motor Driving Made Easy," by M. W. Bourdon. Fourth edition. Pp. vi+181; figs. 78. London: Iliffe & Sons, Ltd. Price 2s. 6d. net.

"In These Days," by R. Brymer. Pp. 302. London: Brentano's, Ltd. Price 7s. 6d net.

"Ultra-Violet Radiation and Actinotherapy," by E. H. Russell and W. K. Russell. Pp. 648; figs. 259. London: E. & S. Livingstone. Price 21s. net.

"Post Office Electrical Engineers' *Journal*." Vol. XXI. Part 3. October, 1928. London: ELECTRICAL REVIEW, Ltd. Price 1s. 3d. net.

Publications of the National Electric Light Association (America).—"Fire Insurance for Gas and Electric Utilities." A serial report of the Insurance Committee, 1927-28 (25 cents). "Lighting Service Manual."—A serial report of the Lighting Service Committee, 1928-29 (40 cents).

"Workshop Practice." Edited by E. A. Atkins, M.I.Mech.E. To be published in about 30 weekly parts by Sir Isaac Pitman & Sons, Ltd., price 1s. each. This is intended to provide a complete work of reference for the pattern-maker, moulder, fitter, and so on.

New French Company.

La Société des Forces Motrices de l'Ouzoum has been formed in Paris with a capital of three million francs, to establish a hydro-electric plant to utilise the Forges falls on the River Ouzoum at Arthez-d'Asson in the Lower Pyrenees Department.

Leeds Electrical Club.

The official opening of the club's premises at Quebec House, Leeds, took place on October 1st, when an inaugural dinner was held. The dinner was attended by the engineer and manager of the Leeds Corporation Electricity Department, and, in the unavoidable absence of the President, Mr. W. B. Woodhouse (Yorkshire Electric Power Co.), the chair was taken by Mr. J. E. Storr, and the guests included the Lord Mayor, Alderman G. Ratcliffe, and the Chief Constable. The Lord Mayor proposed the toast of "The Leeds Electrical Club," and Mr. J. E. Storr responded. Mr. J. D. Green proposed the health of the visitors, and expressed his satisfaction that the club had made such a good beginning. Alderman Brow Dickinson responded. The company, which included 60 members of the club, had a very enjoyable evening, being entertained by Messrs. Dick Wilson, George Lister and Richard Freeman.

The Timber Market.

Our Timber Trade Correspondent reports that imports of European building and general construction woods show a remarkable falling off this year compared with 1927, and stocks are slightly lower than is usual at this time, with expectations that they will be comparatively small by the end of the year. Shippers are now more reasonable in their demands, which will have the effect of fairly extensive selling before the shipping season closes, but as their prices for some time have ruled higher than spot values, plus freight, landing and other charges, consumers are not likely to benefit, especially as the freight market is higher. With smaller supplies on the market during the close season spot prices are more likely to firm up than to recede. The hardwood market is very firm for the better grade mahogany logs, as well as teak and other choice woods. American shippers are also advancing their prices for American sawn woods. Stocks of these here, however, are ample at present rates of demand, but shippers' higher ideas must tend to improve the tone of this section of the market.

Prices of Materials.

Messrs. F. Smith & Co. report, October 9th:—Copper (electrolytic) bars, £71 15s., 20s. inc.; ditto ditto sheets, no change; ditto ditto wire rods, £81 15s., 20s. inc.; ditto ditto h.c. wire, 10 3/16d., ¼d. inc.

Messrs. James & Shakespeare report, October 9th:—No change in the prices of copper bars (best selected), sheet and rod; English pig lead, £23 10s., 5s. inc.

Messrs. Edward Till & Co. report, October 9th:—India-rubber, Para fine, 10¾d., ¼d. inc.

Lighting and Power Notes.

Accrington.—EXTENSION OF SUPPLY.—The Corporation has instructed the electrical engineer to proceed with the laying of cables to Knuzden, at an estimated cost of £2,470. A number of persons have intimated their willingness to take a supply.

Barnstaple.—LOANS SANCTIONED.—The Town Council has received sanction to the following loans: £1,000 for mains and services; £300 for meters; £18,273 for mains; £2,181 for switchgear; £3,230 for generating plant; and £284 for a battery.

Bath.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £35,770 for electricity purposes.

Belgian Congo. — HYDRO-ELECTRIC DEVELOPMENT. — La Société des Mines d'Or de Kilo-Moto, of Brussels, which operates gold mines in the Belgian Congo, has decided to establish a hydro-electric station with a capacity of 10,000 h.p. to utilise the water power of the River Zoro. The distribution system will comprise about 95 miles of h.p. mains.

Blackburn.—CHANGE-OVER.—The Corporation Electricity Committee is making application for permission to change over from d.c. to a.c. in certain areas.

Blackpool.—LOANS.—Sanction has been obtained to borrow £9,500 for new electricity meters. Applications are now being made for sanction to loans of £21,000 for services and £80,000 for mains.

Bristol.—NEW PLANT.—The Corporation Electricity Committee reports that, consequent upon the continued growth of the undertaking, it is now necessary to proceed with the second instalment of the Portishead power station, the works and cost being as follow:—Buildings, £127,147; culverts, £16,780; machinery and equipment, £381,642; transmission cables from Bristol to Portishead, £210,000; engineering expenses, £55,167.

CHANGE OVER.—The Committee also proposes to proceed with the sixth section of the change of the system of electricity supply in part of the centre of the city and Queen Square, St. Philip's Marsh and part of Bedminster. The cost is estimated at £25,796 for mains, £7,850 for sub-station buildings, and £15,500 for sub-station plant. A sum of £6,000 will also be required for additional panels.

Bury.—YEAR'S WORKING.—The report of the borough electrical engineer (Mr. J. G. Potts) on the working of the Corporation electricity undertaking for the year ended March 31st last shows a total revenue of £112,902, working expenditure of £64,743, and contributions to capital of £5,328, leaving a gross profit of £42,831. The figures for the preceding year were: Income, £124,410; working expenses, £89,902; gross profit, £34,508. To the gross profit was added revenue from other sources, making a total of £45,625 available, and, after providing for capital charges, there was a net surplus of £5,995, as compared with a deficit of £672 in the preceding year. The capital expenditure during the year amounted to £25,635, and the total now spent on the undertaking stands at £605,739. The electrical energy sold increased from 23,211,588 to 25,970,672 kWh, and the maximum supply demanded from 9,900 to 10,840 kW.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—A protracted controversy between the advocates of public ownership and those in favour of private enterprise as to the disposal of the Seven Sisters Falls power site on the Winnipeg River in Manitoba, has been terminated by the Dominion Government's action in granting a 30 years' lease of the site to the Northwestern Power Co., a subsidiary of the Winnipeg Electric Company. The grant was made in compliance with the request of

the Manitoba Government. The latter, in accordance with a recent agreement with the Dominion Government, will shortly be given the control of the natural resources of the Province, the disposal of which in the meantime remains with the Ottawa authorities. The site is regarded as a very favourable one as the maximum and minimum flow of water differs only in the ratio of four to one, enabling development at a comparatively low cost. Under the terms of the lease the company agrees to develop 60,000 h.p. within three years, of which the Provincial Government is entitled to take half. At the expiration of the 30-year period the property may be taken over by the Provincial Government.

Cheltenham.—Electricity in Bulk.—At a recent meeting of the Corporation Electricity Committee, the electrical engineer reported that the erection of the bulk supply sub-station in Hesters Way and the necessary switchgear was proceeding, but it would not be completed until rext February, and the Shropshire, Worcestershire, and Staffordshire Electric Power Co. had arranged to give a temporary supply from Tewkesbury. He would therefore shortly be able to commence the change-over to the new system in the Lansdown district.

Colchester.—Extension of Supply.—The Electricity Committee has recommended that subject to a Special Order being obtained, a supply of electricity be given to Wivenhoe Urban District Council and Messrs. Daniell & Sons' breweries at West Bergholt. The estimated cost of the scheme, which includes the purchase of the undertaking of the Wivenhoe Electricity Co., is £6,500.

Continental.—Spain.—A group of Bilbao banks has founded a company to construct power plants and exploit the waterfalls on the River Duero. When these plants are put into operation they will be able to supply 300,000 h.p.—*Reuter's Trade Service* (Madrid).

Austria.—The Berlin correspondent of the *Financial Times* states that Messrs. S. Schoenberger & Co., bankers, Berlin and Amsterdam, in their weekly report on Mid-European economics, state that further progress has been made with the scheme for the electrification of Austria, in that the negotiations concerning the development of the power station at Zillertal, near Innsbruck, are approaching conclusion, as the leading Austrian banks that are interested in the enterprise have declared their willingness, in principle, to finance the project. International importance attaches to the enterprise, for it is probable that the Bavarian and Italian industries will apply for a supply of electric power.

France.—For the past six years the Compagnie Parisienne d'Electricité has been engaged in unifying the distribution system in the Paris district at 50 cycles a.c. It is announced that about 42 per cent. of the change-over work has now been carried out, and it is expected that the whole of the work will be completed by 1930.

Erith.—Loan Sanctioned.—The Urban District Council has received sanction to a loan of £3,873 for the provision of mains and a sub-station in connection with the supply of electricity to the flour mills of Cannon & Gaze, Ltd., and the Thames Milling Co., Ltd.

Heston and Isleworth.—Electricity Supply.—The Urban District Council Electricity Committee is to extend mains in the district, install distributing plant at two sub-stations at a cost of £21,542, and provide two chain grate stokers at the generating works at a cost of £2,035.

Leicester.—Grit-arresting Plant.—In order to reduce the grit nuisance from the central generating plant, the Electricity Committee proposes to spend £15,330 on a grit-arresting plant.

Manchester.—Progress during July and August.—During the months of July and August the Corporation electricity undertaking showed an increase in connections of 4,153 kW, bringing the total up to 362,857 kW; and the number of applications received for supply, including those for additional supplies, was 2,196, representing a total of 4,867 kW. The number of hired cookers connected increased by 146, bringing the total actually on circuit to 4,731. Applications for the hire of cookers totalled 154. The change-over in the system of supply from d.c. to a.c. has been completed in six areas, involving a total of 1,726 consumers, and work is now in progress in the Withington area. Three new sub-stations were put into commission at Egerton, Water Street pumping station, and Messrs. C. & A. Modes, Ltd., and new plant commenced working at seven existing sub-stations.

New Zealand.—Christchurch.—The accounts of the municipal electricity undertaking (engineer, Mr. E. Hitchcock) for the year ended March 31st last record a total revenue of £194,037, from which the following charges had to be met: Purchase of electricity in bulk, £68,000; working expenses, £46,560; interest, £26,211; depreciation, £30,749. There was therefore a net surplus of £22,517, as compared with a surplus of £23,997 in the preceding year. The revenue from appliance trading, wiring, &c., was £53,930, and the expenditure amounted to £50,944, leaving a balance of £2,986. Energy is purchased in bulk from the Lake Coleridge hydro-electric power undertaking, and the total purchased was 39,757,621 kWh. The sales of electricity increased from 29,119,422 to 34,894,754 kWh. An additional 52¼ miles of services and 30½ miles of mains were installed, and 72 miles of mains were replaced. The length of street lighting mains was increased by 10 miles.

Plymouth.—Loans Sanctioned.—The Corporation Electricity Committee has obtained sanction to loans of £29,525 for mains, and £16,610 for sub-station equipment.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Weybridge.—*Urban Electric Supply Co., Ltd.*—Lighting: From 9d. to 8d. per kWh. Heating: From 4½d. to 2½d. per kWh. Power: From 7d. to 3d. per kWh.

Horsham.—Power and heating: The charge of 3d. per kWh for under 100 kWh has been abolished and a flat rate of 1½d. per kWh substituted.

Hawkhurst.—*The Weald Electricity Supply Co., Ltd.*—Lighting: 11d. per kWh. Heating and power: 4d. per kWh. Cooking, water heating, and shop-window lighting between 6 p.m. and 9.30 p.m.: 3d. per kWh. There is an alternative tariff for lighting, heating, cooking, and domestic supplies, of 2d. per kWh, plus a standing charge according to the ratable value of the premises.

Rotherham.—Power: A reduction of 10 per cent. Lighting: A reduction of ¼d. per kWh.

Mansfield.—Lighting: Flat rate from 6½d. to 6d. per kWh; maximum demand rate from 8d. and 3d. to 8d. and 2½d. per kWh; prepayment meters from 7d. to 6½d. per kWh. Power: Factories on demand rate for power, lighting units charged at power rates will be increased from 3 per cent. to 6 per cent. of the total energy used for power.

Grays.—Power: First 500 kWh per quarter, from 3d. to 2½d. per kWh. Heating: From 3d. to 1½d. per kWh.

Seaham Harbour.—Year's Working.—We are informed by Mr. H. Adam, electrical engineer and manager of the Urban District Council's electricity undertaking, that there was a net profit on the past year's working of £997. There was a considerable increase during the year in the cooker load.

Special Orders.—Application has been made to the Electricity Commissioners by the Holderness Trust, Ltd., for a Special Order authorising it to supply electricity in the urban district of Withernsea and the rural district of Patrington.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Burnham & District Electric Supply Co., Ltd., to supply electricity in part of the urban district of Burnham-on-Sea, and the Urban District Council of Dronfield to supply electricity in the urban district of Dronfield.

Sudbury.—Electricity Supply.—The *East Anglian Daily Times* reports that a further stage in the development of the electricity services of South Suffolk, and of Sudbury in particular, was inaugurated on October 1st, when Mr. F. H. Trinder, editor of the *Suffolk and Essex Free Press*, who was accompanied by Mr. Lauder, the local resident engineer of the East Anglian Electricity Co., switched on the 11,000-V supply from Braintree to Sudbury, and subsequently switched on the electricity which had been transformed from the high voltage to a lower one, and so put into circuit the south side of the Market Hill, rendering it independent of the supply from the local generating station. This is the first stage of the important developments which the East Anglian Electricity Co. is making in the electrification of South Suffolk, and which is part of the Government's scheme affecting East Anglia. Up to the present, the electricity which has been supplied to Sudbury consumers has been generated at the company's own station at the Quay, Sudbury. Now the energy is generated at Braintree, and brought by overhead lines through Halstead, where the lines are tapped for the supply to Sudbury. For some distance the lines go across country, and the supply will be available for numerous villages and farms which lie along the route. The transmission lines enter a transformer station, which reduces the pressure from 11,000 V to 415 V for power purposes and to 240 V for lighting.

Wellington (Salop).—Revocation of Order.—The Urban District Council, in consequence of a communication from the West Midland Joint Electricity Authority, has consented to the revocation of the Wellington Electric Lighting Order. The Authority will submit schemes at once, and cables will be laid in the town by the early part of 1930.

Willaston.—Street Lighting.—The Parish Council has accepted the offer of the Electricity Distribution of North Wales and District, Ltd., for public lighting by 53 lamps at £3 11s. each for a period of 1,070 hours, with a ten years' contract.

Llandilo.—Inquiry Decision.—The Urban District Council has received from the Electricity Commissioners their decision following an inquiry held recently into the Council's application for sanction to extend its power station. The Commissioners have refused sanction to the extensions, and favour the scheme of the Llanelly & District Electric Lighting and Traction Co., Ltd., for providing a bulk supply.

Torquay.—Inquiry Decision.—Following on the inquiry which was held in June last into the applications of the Corporation and the Teignmouth Electric Lighting Co., Ltd., for a Special Order to supply electricity in Buckfastleigh, Ashburton, West Buckfastleigh, Dean Prior, Rattery, Ilsington, Lustleigh, Moretonhampstead, Manaton, and Bickington, the Electricity Commissioners have refused the company's application, and have decided to grant the Corporation's application, subject to certain conditions.

Tramway and Railway Notes.

Accrington.—'Bus Service.—Arrangements are complete for the commencement in November of an Accrington Corporation express 'bus service between Accrington, Haslingden and Rawtenstall. So long as the present tramway exists, the 'bus service will be supplementary to the tramcars, but when the existing track is worn out 'buses will probably supersede the trams altogether.

Australia.—Melbourne.—According to the *Electrical Engineer of Australia and New Zealand*, the Melbourne Tramways Board has decided to postpone for the present further work on its programme of converting the cable tramways to electric traction. Already over one-third of the cable system has been converted, and it is the set policy of the board to convert the remainder, but the financial position does not warrant any further work on the scheme being commenced at present. The board anticipates that its operations during the year ended June 30th, 1928, will be found to have resulted in a deficit of £40,000. The revenue from passenger fares decreased by over £13,000 during the year, and the expenditure increased considerably. Amongst the capital charges are additional interest and allocation to reserves on account of the conversions already completed. These conversions have been paid for out of reserve funds, but the reserves are now nearly depleted. During the year ended June 30th last the electric and cable cars and the motor-'buses carried 220,353,338 passengers, a decrease of 3,858,534 compared with the previous year. Through the conversion of the Richmond line, the difference in the number of passengers carried on the cable lines as compared with the electric became further pronounced. The cable car passengers decreased from 99,978,416 to 83,004,759, while the passengers on the electric cars increased from 118,858,967 to 132,805,672. Similarly, through the withdrawal of the 'buses on the Richmond line with the completion of conversion in December, the 'bus passengers decreased from 5,374,484 to 4,542,902.

Bolton.—Track Renewal.—The Corporation Tramways Committee has decided to relay the Great Lever route tramway track.

Brighton.—Track Renewals.—When the proposal to relay the tramway track in the Victoria Gardens instead of in the road came before the Town Council, it was rejected, but a resolution moved by the chairman of the Tramways Committee, that the track should be relaid at the earliest possible moment at a cost of about £18,000, laying the rails in their present position, was passed by a majority of 48 to 12.

Continental.—Spain.—A new electric tramway is approaching completion between the town and railway station of Guadix. Application has been made for a concession to construct and work an electric tramway in the town of Sanabria, Province of Zamora.

London.—Underground Railway Improvements.—*The Times* reports that the Underground Railway Companies announce that 78 more cars will be operated on the Underground this winter than last year during the busy hours, and this number will be augmented by a further 34 cars as quickly as these are built and delivered. The winter programme of train services on the Bakerloo, Piccadilly, and Central London lines began on October 1st. On the District Railway the new schedules are already in operation, but further new rolling stock, shortly to be delivered, will enable additional improvements to be made later. On the Hampstead and City lines, certain improvements in the services will be made forthwith. The full programme will be completed during the month. On the Central London Railway there will be material improvements, especially between Liverpool Street and Ealing. Other improvements are also to be made on the Underground this winter. These include the rebuilding of Post Office Station and Ealing Common Station and reconstruction work at Mansion House Station. The current year will see the completion of the rebuilding schemes now in hand at St. James's Park, Charing Cross, and Piccadilly Circus Stations.

A third escalator was put into service at Oxford Circus station, Bakerloo Line, on October 2nd. It is of the new comb-type and can be reversed if necessary to suit the flow of traffic. In 1925 32,665,000 passengers used the station. Last year the figure was 34,415,000.

Manchester.—New Route.—The Corporation Tramways Committee is applying for sanction to the construction of a tramway along Lightbowne Road from Dean Lane to Nuthurst Road.

Plymouth.—Tramcars *v.* 'Buses.—In the course of a special report by the Corporation Tramways and Transport Committee with regard to tramcars and motor-'buses the value of the tramway to the electricity undertaking is emphasised. The report states that the abandonment of the tramway, by discontinuing the use of electricity, would cause a considerable amount of plant owned by the Electricity Department to become surplus, and in some instances of no further use. The amount expended in respect of cables, plant and equipment owned by the Electricity Department and used exclusively for the purpose of supplying the tramways is £50,000, on which there still remains a net debt of approximately £31,500. The estimated amount which would be recoverable from the sale of this plant and equipment is £1,580. These figures make no allowance for any capital expenditure incurred in respect of the main generating plant, buildings or other equipment of the Electricity Department, nor any portion of the plant which could be used as a stand-by for general supply. The Electricity Department would lose an annual revenue of £30,000 per annum, against which the only material saving would be the coal consumed and wages to the extent of about £7,000 per annum, and the loss of the useful load provided by the tramway must increase the average cost of production and consequently increase the charges to the remaining consumers. The Tramway Department at the present time takes 35 per cent. of the total energy sold by the Electricity Department, and provides 19 per cent. of the total revenue.

Telegraph and Telephone Notes.

Australia.—Radio-telephony.—Mr. Brown, Director of Postal Services, predicts the early establishment of a wireless telephony service between Australia and the United Kingdom. The *Daily Telegraph* reports him as saying that it will be a Government controlled service, undertaken by the British and Australian Governments conjointly.

Holland.—Amsterdam Telephone Service.—The last of the old system telephones was recently converted into the automatic system, thus completing the work of conversion which has occupied the past six and a half years.—*Reuter* (Amsterdam).

Hull.—Telephone Service.—The Hull Corporation Telephone Committee has appointed the chairman (Alderman Ombler), the vice-chairman (Mr. Frank Finn), the Deputy Town Clerk (Mr. Graham Wilson), and the manager and engineer (Mr. T. Holme) to interview the Secretary to the Postmaster-General with reference to the renewal of its licence to work the telephone system, which expires in 1932. The Corporation was granted the licence in August, 1902, and the municipal telephones were worked in competition with the National Telephone Co.'s system until it was purchased by the State in 1911, when the Post Office granted the Hull Corporation a licence for 21 years. In view of the fact that considerable extensions are contemplated the Committee desires to know its position when the present licence expires. Standard Telephones & Cables, Ltd., automatic equipment is to be installed.

Italy.—International Wireless Congress.—The International Juridical Wireless Telegraph Conference at Rome has passed a resolution expressing the opinion that preparation should be made for a revision of the Washington Convention at the next Conference, that measures should be taken for the preparation of an international juridical settlement and for its enforcement, and that problems of private wireless should be settled by international methods by means of agreements reached at diplomatic conferences.—*Reuter* (Rome).

According to *The Times*, a discussion took place on the use of wireless in the salvage of ships and aircraft, and on the compensation to be paid to those who take part in the salvage operations.

The last meeting of the Conference was held on October 6th. A resolution was passed expressing a desire that the central committee should arrange for the next congress to be held in Madrid.—*Reuter* (Rome).

Radio Notes.

Germany.—New Stations.—The German short-wave high-power station will, it is stated by *World-Radio*, begin broadcasting early next year. Progress is being made with the two simultaneous transmitters at Berlin (East) and Magdeburg, and it is hoped that they will be finished by December. At the Flensburg station work has begun on the aerial masts. With the completion of these three stations, the total number of German transmitters, reduced to twenty-four when Dortmund closed down, will be increased to twenty-seven.

Llandudno.—Relay Service.—The Urban District Council has consented to the proposals of Broadcast Relay Service, Ltd., to open a broadcast reception relay station in the town and erect wires where necessary.

Spain.—Reopening of San Sebastian.—The Union Radio station at San Sebastian (EAJ8) has renewed its transmissions, which consist of relays of orchestral concerts from the Gran Casino, concerts by the municipal band in the Boulevard kiosk, and the Madrid programme every Tuesday, says *World-Radio*. Arrangements have been made to increase the power of the Union Radio station at Madrid (EAJ7) to 3 kW.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—Melbourne.—Posts and Telegraphs Department. November 13th. Switchboard keys and parts. (B.X. 4752.)*
November 27th. Condensers. (B.X. 4753.)* Indicators. (B.X. 4751.)*
November 29th. Telephone apparatus. (B.X. 4757.)*
November 20th. Relays. (B.X. 4729.)*
November 14th. Totally enclosed metal-clad type switchgear and spares. (B.X. 4748.)*
November 28th. Victorian Railways. One 10-ton overhead electric crane. (A.X. 6951.)*

Victorian Electricity Commission.—December 17th. Supply of metal-clad switchgear and accessories. (Spec. 28/68, £1 1s. for three copies.)

Darlington.—October 15th. Electricity Department. Cooling tower. (September 21st.)

Egypt.—November 10th. Ministry of the Interior. Supply and installation of a distribution network for the village of Kena. (B.X. 4707.)*
November 24th. Electric lighting installation for Sohag. (B.X. 4777.)*

Erith.—October 15th. Electricity Department. H. and l.p. cable. (October 5th.)

India.—October 16th. India Store Department. Oil-engine-driven alternator sets and switchgear for Ahmednagar. (B.X. 4714.)*
November 2nd. Three 75-kW oil engine alternator sets, water-cooling plant, tanks, switchboard cables, &c. (September 21st.)
October 17th. One water turbine and two oil-driven d.c. generating sets for the Mardan power station. (A.X. 4733.)*
October 26th. Bombay, Baroda and Central India Railway Co. Gasfilled and vacuum lamps. (See this issue.)

Irish Free State.—Dublin.—November 5th. Electricity Supply Board. Two 5,000-kVA transformers and switchgear. (October 5th.)
Waterford.—October 19th. Harbour Commissioners. 20-ton electrically-operated hoisting and slewing travelling crane. Specifications (21s.) from the Harbour engineer.

Leven (Fife).—Fife and Kinross District Board of Control. Electric lighting, &c., installations for the nurses' home at Asylum, Cupar, Fife. Specifications from Mr. A. D. Haxton, architect, 3, High Street, Leven (two guineas deposit).

London.—Southwark.—October 23rd. Electricity Department. Electric cable for 12 months. (September 14th.)
London County Council.—November 12th. Four electrically-driven centrifugal sewage pumping sets with switchgear, transformers, cables &c. (October 5th.)
Wiring and fittings for electric lighting two blocks of tenement dwellings on the East Hill estate, Wandsworth. (See this issue.)
Metropolitan Asylums Board.—October 31st. Automatic telephone installation for High Wood Hospital for Children, Brentwood. (See this issue.)

New Zealand.—Wellington.—November 27th. Public Works Department. Generators and water turbines, in connection with Section 1 of the Waitaki power scheme. (B.X. 4677.)*
December 20th. New Zealand Government Railways. Substation equipment for Frankton Junction power and signalling supply. (B.X. 4771.)*
November 13th. Transformers. (B.X. 4775.)*

Rochdale.—November 13th. Electricity Department. A.c. single-phase prepayment meters for 12 months. (October 5th.)
November 17th. Electricity Department. One 12,000-kVA transformer with boosting transformers and switchgear. (See this issue.)

South Africa.—Johannesburg.—November 9th. Posts and Telegraphs Department. Wall telephones for the Hillbrow exchange. (B.X. 4709.)

November 15th. Dry cells and voltoids. (B.X. 4729.)*

November 8th. South African Railways and Harbours. Electrically-driven overhead travelling cranes for Pretoria and Pietermaritzburg workshops. (A.X. 6815.)*

November 1st. Town Council. Six induction voltage regulators. (B.X. 4768.)* Transformers. (B.X. 4783.)* Truck-type switchboard cubicles. (B.X. 4782.)*

Port Elizabeth.—November 8th. City Council. 22,000-V armoured type switchgear. (B.X. 4763.)*
October 25th. Transformers. (B.X. 4760.)*

Durban.—October 26th. Corporation. Ten single-phase and two three-phase transformers for Alice Street power station. (B.X. 4761-2.)*

Turkey.—Angora.—October 30th. Direction Générale des Chemin de fer et Ports d'Etat. Overhead electric travelling crane. (A.X. 6954.)*

Wakefield.—October 18th. West Riding Education Committee. Installation of electric light at the Thorne Grammar School. Particulars from the Education Committee, County Hall, Wakefield.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Birkenhead.—Electricity Committee. Accepted:—
L.p. cable.—(£4,322) Hackbridge Cable Co., Ltd.; (£807) W. T. Glover & Co., Ltd.
L.p. 4-core p.l. and s.t.a. cable.—(£2,366) W. T. Glover and Co., Ltd.; (£1,110) Macintosh Cable Co., Ltd.
Switchgear cubicle (£102).—Ferguson, Pailin, Ltd.
Two 200-kVA transformers (£282).—Hackbridge Electric Construction Co., Ltd.
Ferries Committee. Accepted:—
Electric clock for Woodside station.—Gent & Co.

Bury.—Town Council. Accepted:—
Circulating pipework for new 10,000-kW turbo-alternator at Chamber Hall Power Station.—J. Wolstenholme.

Chester.—Board of Guardians. Accepted:—
Electrical gear.—Commercial Electric Co., Chester.

Colchester.—Town Council. Accepted:—
300-kVA transformer (£280).—English Electric Co., Ltd.
Three feeder panels (£827).—Electric Construction Co., Ltd.

Derby.—Borough Council. Accepted:—
Turbo-alternator (£51,650).—C. A. Parsons & Co., Ltd.
Two boilers and auxiliary plant (£46,068).—International Combustion, Ltd.

Egypt.—The following are the most important tenders received for the supply and laying of the Cairo-Alexandria trunk cable:—

	(£E)
Siemens, Bros. & Co., Ltd.	205,300
Standard Telephones & Cables, Ltd.	217,973
Standard Telephones & Cables, Ltd., first alternative	227,672
Standard Telephones & Cables, Ltd., second alternative	159,497
British Insulated Cables, Ltd.	222,437
W. T. Henley's Telegraph Works Co., Ltd. ...	226,994
Callender's Cable & Construction Co., Ltd. ...	227,296
W. F. Dennis, agent for Felten & Guillaume	234,564
Pirelli	246,589
Pirelli, first alternative	187,949
Pirelli, second alternative	152,375
Siemens & Halske	251,847
Siemens & Halske, first alternative	149,126
Siemens & Halske, second alternative	133,970

The main quotations are for heavy-loaded cable and the alternatives are generally for up-to-date repeatered cable similar to that used for long-distance trunk lines in Europe.

—*Reuter's Trade Service* (Cairo).

Glasgow.—Tramways Committee. Recommended:—
Copper bonds.—Thomas Bolton & Son, Ltd.
Commutators.—Dyer & Young, Ltd.
V.i.r. cable.—Hackbridge Cable Co., Ltd.
Water Committee. Accepted:—
Electrification of the pumping station at High Street (£199).—Allan Arthur & Ure.

Hull.—Telephones Committee. Accepted:—
Automatic telephone equipment (£15,098).—Standard Telephones & Cables, Ltd.

Liverpool.—Tramways, Electric Power and Lighting Committee. Recommended :—
70 40-h.p. D.K. tramcar motors (£13,300).—English Electric Co., Ltd.
Tramway steelwork.—(£650), Hadfields, Ltd.; (£1,407), Edgar Allen & Co.; (£919), Titan Trackwork Co., Ltd.
Mersey Docks and Harbour Board.—Accepted :—
Electric cable.—British Insulated Cables, Ltd.

London.—St. Marylebone.—Electricity Supply Committee. Recommended :—
Transformers for 12 months.—Metropolitan-Vickers Electrical Co., Ltd., and British Electric Transformer Co., Ltd.
Switchgear for 12 months.—Ferguson, Pailin, Ltd., and Metropolitan-Vickers Electrical Co., Ltd.
Meters for 12 months.—Chamberlain & Hookham, Ltd., and Ferranti, Ltd.
H.p. testing equipment (£443).—Watson & Sons, Ltd.
Four auxiliary grit catchers (£180).—Davidson & Co., Ltd.
Hackney.—Electricity Committee. Recommended :—
Electric hoist (£101).—H. Morris, Ltd.
General Post Office. Accepted :—
Protectors.—Edison Swan Electric Co., Ltd.

Maidstone.—Town Council. Accepted :—
Cooling tower (£2,155).—Peter Brotherhood, Ltd.

Manchester.—Education Committee. Accepted:—
Electric light renewals at Central High School for Girls and additions to electric lighting at School of Art.—Sudlow & Co.
Installation of electric lighting at Cheetham municipal school.—H. Crossley.
Electricity Committee. Accepted :—
Domestic cookers.—Revo Electric Co., Ltd., and Credenda Conduits Co., Ltd.
Maintenance of 33-kV feeders.—Callender's Cable & Construction Co., Ltd.
Static transformers.—Metropolitan-Vickers Electrical Co., Ltd.
Tramways Committee. Accepted :—
Tram rail bonds.—British Insulated Cables, Ltd.
Tramcar motors.—British Thomson-Houston Co., Ltd.
Tramcar motors and controllers.—General Electric Co., Ltd.
Sand drying plant.—Pratchitt Bros.
Health Committee. Accepted :—
Installation of electric refrigerating plant at Baguley Sanatorium.—J. & E. Hall, Ltd.
Water Committee. Accepted :—
Electric lighting of houses at Thirlmere.—Brown & Co. (Electrical Engineers), Ltd.

New Zealand.—The Thames Valley Electric Power Board, of Auckland, N.Z., has accepted the tender of a German firm for cables and boxes for a sub-station. The next lowest tender was that of a British firm, which was 80 per cent. higher than the German price.—*Reuter's* (Wellington).

Rotherham.—Electricity Committee. Recommended:—
Cable.—Hogan & Wardrop, Ltd. (£5,029), Callender's Cable & Construction Co., Ltd. (£275).
Education Committee. Recommended :—
Electric light installations at Thorpe Hesley school (£124).—Ibbotson Bros. At Thornhill school (£142 6s.).—Lilleker Bros., Ltd.

Spenborough.—Electricity Committee. Accepted:—
Work in connection with the change over to alternating current supply in Tofts Road, Carr Street, and Sykes Street, Cleckheaton.—F. W. Birkett & Sons, Ltd.

Warrington.—Electricity Committee. Accepted:—
Cables.—British Insulated Cables, Ltd.
Sub-station switchgear.—George Ellison.

Forthcoming Events.

International Exhibition of Inventions.—October 10th to 20th. Central Hall, Westminster.

Junior Institution of Engineers.—Friday, October 12th. 39, Victoria Street, S.W. 7.30 p.m. "The Use of Instruments in the Boiler House." Mr. F. Squirrell.
Friday, October 19th. "Technical Advertising." Mr. R. H. Sharp.

Diesel Engine Users' Association.—Friday, October 12th. 5.30 p.m. "Marine Oil Engines." Mr. S. B. Freeman.

Institution of Electrical Engineers (Sheffield Sub-Centre).—Wednesday, October 17th. Royal Victoria Hotel, Sheffield. 7.30 p.m. Address by the chairman, Mr. R. G. Ward.

(North-Eastern Students' Section).—Friday, October 12th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. Address by the chairman, Mr. I. H. Hedley.

(South-Midland Centre).—Thursday, October 18th. Grand Hotel, Birmingham. 7 p.m. Address by the chairman, Mr. S. H. Holden.

British Institute of Radiology, incorporated with the Röntgen Society.—Thursday, October 18th. 32, Welbeck Street, W. 8.30 p.m. Opening meeting.

British Electrical Development Association.—Friday, October 19th. Royal Society of Arts, John Street, Adelphi, W.C. 7.30 p.m. "Organising for Better Selling in Electrical Showrooms." Mr. W. Millner.

Engineering and Scientific Club (Wolverhampton).—Friday, October 19th. 7 p.m. "The Screened Grid Valve." Mr. F. Youle.

Birmingham Electric Club.—Friday, October 19th. Grand Hotel. 7.0 p.m. Annual ladies' evening.

Institution of Mechanical Engineers.—Friday, October 19th. The Institution, Storey's Gate, S.W. 6 p.m. Presidential address by Mr. R. W. Allen.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

An alarm which will indicate when water is not flowing in a pipe.

Notes.

South Wales Mining Electrical Engineers.

The South Wales Branch of the Association of Mining Electrical Engineers held its first general meeting of the new session at Cardiff on October 6th. The retiring chairman, Major E. Ivor David, presided at the outset. Capt. J. M. Carey, H.M. Divisional Inspector of Mines, attended to present certificates to the successful candidates at the recent examination. Out of 16 entrants from South Wales, 15 were successful, while out of three honours certificates for the whole country, one had come to South Wales. Capt. Carey said that in South Wales the standard of maintenance was so excellent that whenever Mr. Horsley came down to see him, he told him he found very little to do. This credit was due in no small degree to the activities of the Association Branch.

Reviewing the work of the branch during the past year, Major David referred to the untiring efforts put forward by the hon. treasurer, Mr. A. C. MacWhirter, and the hon. secretary, Mr. H. J. Norton. He also expressed thanks to the South Wales Institute of Engineers for the use of their lecture hall and offices, and for their kindly assistance at all times. During the year they had maintained their standard, both as regarded meetings and examination results. They had obtained the highest number of awards in the country.

In his address, Mr. T. S. Thomas, the incoming president, outlined the aims and objects of the Association. To promote the general advancement of electrical science in its application to the mining industry required more than ordinary knowledge. How far they had advanced could be appreciated when they realised that at the present time there was not a single instance of the application of power in and about mines that had not been successfully attempted by electrical methods. To-day the membership of the Association exceeded 2,000. The coming year would be one of great importance in view of the appointment by the Mines Department of a committee to consider the qualifications of mining electrical engineers. All branches of the Association were exerting their influence towards the compulsory certification of the electrical engineer responsible under the Coal Mines Act for the plant under his supervision. If the Association succeeded in its efforts, it behoved every member to make more of the opportunities afforded by the Branch. The Government's electrification scheme for South Wales was expected early next year, and would, no doubt, be welcomed by many collieries which had been compelled to close down through the lack of an economic power supply.

Appointments Vacant.

Assistant electrical engineer (£600) for the Government of Sierra Leone. Hydro electrical engineer for the Irrigation Branch, P. W.D., United Provinces, India. Canvasser for the City of Stoke-on-Trent Electricity Department. Engineer and manager (£208) for the Kirkwall and District Electricity Supply Undertaking. Cable-jointer for the Lowestoft Corporation electricity works. Assistant switchboard attendant (79s.) for Leyton Borough Council Electricity Department. Assistant lecturer in mathematics and demonstrator in physics or mechanics (£300) for the Faraday House Electrical Engineering College. Power house superintendent (£471) for Cheltenham Corporation Electricity Department. Clerk (£130) for the Kingston-upon-Thames Corporation Electricity Department. Assistant lecturer in physics and electrical engineering (£250) for the Belfast Education Committee. (See our advertisement pages to-day.)

Extensions at Shanghai.

The accompanying illustrations are reproductions of photographs we have received from Mr. T. H. U. Aldridge, M.I.E.E., engineer-in-chief and manager of the Shanghai Municipal Electricity Department, indicating the progress that has been made with the 40,000-kW extension that is now being carried out. Two new 20,000-kW turbo-alternators are being installed

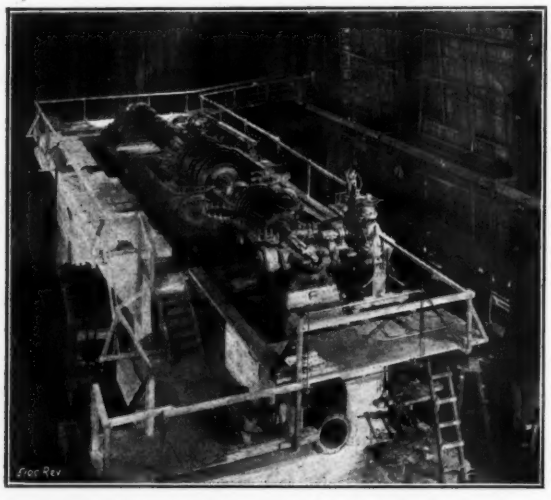


Fig. 1.—20,000-kW Turbo-alternator Nearing Completion.

by the Metropolitan-Vickers Electrical Co., Ltd., and fig. 1 shows the progress made with the first set at about the beginning of last month. It was expected that by this time the second set would be on its way from Trafford Park. The machines are designed to operate with steam conditions of 350 lb./sq. in. and 700 deg. F., at 3,000 r.p.m. Two-stage and three-stage bleeding has been arranged for the first and second turbines, respectively. In the boiler house four 140,000-lb. boilers are being erected, two by Messrs. Babcock & Wilcox, Ltd., and two by the Stirling Boiler Co., Ltd. Fig. 2

Fig. 2.—Boiler House, showing Erection of First Two 140,000-lb. Boilers.

shows the boiler house with the first two boilers, Stirling, nearing completion. Pulverised-fuel equipment has been supplied by International Combustion, Ltd., and is of the "Lopulco" system. Murray fin-tube water walls are provided. Four "Raymond" mills are being installed, one of which is shown in fig. 2 left. This extension will bring the capacity of the station up to 161,000 kW.

Industrial Electric Heating.

Mr. A. R. Page, of the Metallurgical Department of the B.S.A. Company, delivering his presidential address to the members of the Birmingham Metallurgical Society at a meeting held at the Engineers' Club, Birmingham, on October 4th, dealt with the subject of the speeding-up of engineering production. He pointed out that the heat-treatment of high-speed steels was a very important operation. The high temperatures necessary for correct hardening were difficult to control, and even if attained satisfactorily, they were not easy to measure accurately. The advent of electricity had placed in the hands of the engineer two further methods of hardening—the salt bath method and the dry electric furnace—which provided very accurate control of temperature and ease in measurement. There appeared to be every reason to believe that the utilisation of electricity for industrial heating had got to come, even in this country, especially when the reorganisation of electricity supply was nearing completion. For very large heating installations it was probable that gas, oil or solid fuel would hold their own, but for furnaces of moderate size electric heating not only afforded many advantages in operation and improvement in the quality of the product, but actually was cheaper, taking all things into consideration, than the other methods. That statement was based on the industrial price of gas and electric power in Birmingham. The remarks made with regard to the hardening of high-speed steel also applied to the treatment of the carbon tool steels. Undoubtedly electric furnaces were the ideal method of heating. Great advances had been made during the last twenty or thirty years in the production and heat treatment of tool steels, and in the selection of the material for a particular job. Furthermore, the heat treatment processes of the tools had to be studied very carefully from the point of view of the material which was being fashioned, since tools of the same composition, cutting different materials, required to be treated to different hardnesses. The study of tool steels and tool manufacture was a most fascinating and complicated one.

Electric Threshing Demonstration.

On October 4th, at the White House Farm, Pettistree, by permission of Mrs. F. Pearson, an interesting demonstration of electric threshing was carried out under the auspices of Messrs. Ransomes, Sims & Jefferies, Ltd., in conjunction with the East Suffolk Electricity Distribution Co. During the demonstration between 14 and 15 coombs of barley were dealt with per hour, and at the conclusion of the morning's run an analysis of the figures showed a consumption cost of

Electric Threshing at Pettistree.

1¼d. per coomb with electricity at 2d. per kWh. The accompanying illustration shows the equipment during the demonstration. The driving unit was a 25-h.p., 3-phase, 400-V, drip-proof Ransomes motor, complete with waterproof control gear, mounted on a 4-wheel under-carriage with shafts for transport. By belt driving, a Ransomes A 11-54 drum and chaff-bagger, fitted with ball bearings throughout, was operated.

Television.

In an endeavour to obtain an independent transmitting licence, or to extend its present experimental facilities, for the purpose of initiating a broadcast wireless television service, the Baird Television Development Co., Ltd., recently demonstrated its system to officials of the Post Office. Following a discussion between the G.P.O. and the British Broadcasting Corporation, the Baird Co. has been formally invited to demonstrate its apparatus to the B.B.C. The latter has already arranged to commence the transmission experimentally, from one or more of its stations, of still pictures (facsimile photo-telegraphy) towards the end of this month on the "Fultograph" system outside regular radio-telephone broadcasting hours. The B.B.C. is satisfied that the system merits a public trial, which will cost little as Wireless Pictures (1928), Ltd., is providing the necessary apparatus. Receiving instruments (see p. 625 this issue) are to be imported into this country from Vienna, Austria, it is understood, and the B.B.C. will not have anything to do with their distribution. The B.B.C. does not, of course, bind itself to any one system and the sequel to the Baird television demonstrations will be awaited with interest. It has been hinted that if facilities are not provided in this country, a television service may be conducted from the Continent, probably Holland.

Quantock Hills Hydro-Electric Plant.

The old mill water-wheel at Coombe House, Holford Glen, the noted Quantock Hills beauty spot, long disused for its legitimate purpose of providing power for corn grinding, has been put to modern use for driving electric power plant to provide light and power for the house and surroundings. Besides driving a dynamo, the water-wheel is also arranged to drive a saw and a shoe-polishing machine. The shaft of the mill wheel

Old Mill Wheel Re-used.

is 12½ inches square, and the teeth of the cog wheels which connect it to the other machines are all hand made of wood. The accompanying illustration shows the mill wheel.

Insulating Oils.

As we go to press we have received the following letter:—

I have read the article entitled "Insulating Oils" in the current number of your paper. I strongly object to your foisting matter of this kind on your readers.

The article purports to commend the Purchasing Specification of the British Engineering Standards Association. The writer sets forth a garbled, inaccurate and inadequate presentation of the B.E.S.A. tests.

The B.E.S.A. Specification is the result of many years' co-operative work between the leading expert manufacturers and users of insulating oils. The Association I represent has alone spent many thousands of pounds in preparing recommendations embodied in the Specification. The Specification itself can be purchased for 2s.

If you or your contributors have any valid objections to the proposals in the Specification, why not state them? In the alternative, why put forward ill-considered and ill-informed explanatory matter of proposals which need no explanation to those competent to use them?

E. B. Wedmore,
Director and Secretary, British Electrical and Allied Industries Research Association.

London, *October 8th,* 1928.

We regret that the article in question was distasteful to Mr. Wedmore, but we do not regret its insertion, nor do we accept his pontifical claim to suppress articles which do not meet with his approval. The B.E.S.A. specifications command the respect of the engineering world, and will neither suffer injury at the hands of our contributor (who, no doubt, will reply in due course) nor profit by ill-tempered support.

E.A.W. Activities.

The "Electrical Outlet Campaign" was inaugurated in Birmingham on Thursday last week by the Birmingham and Midland Branch of the Electrical Association for Women. Lady Brooks, presiding at a large meeting held at the Queen's College, pointed out that there was a great lack of electrical "outlets," or plugs, in the average house, and the object of the campaign was to impress upon architects, builders, local authorities, and electricity supply undertakings the advantages of the provision of an adequate number of outlets during building.

Miss C. Haslett (London, director of the Association), explained the Women's National Specification (based on the plan of a standard house), showing the suggested positions of "outlets" in the various rooms. There was a feeling that the "national specification" would involve too high a cost for small houses, though economies could be effected by reducing the number of "outlets" in each room.

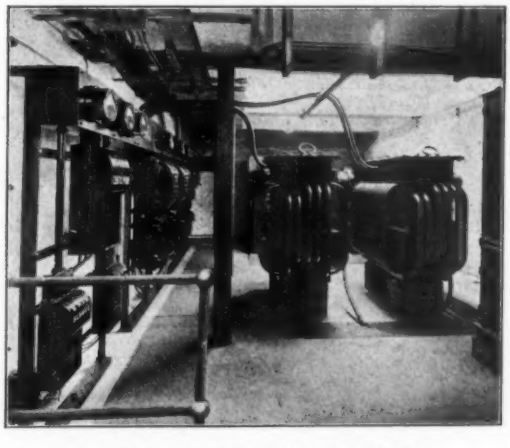
A branch of the E.A.W. is in course of formation at Rugby. The inaugural meeting was to be held yesterday, October 11th, in the Benn Buildings; the chair was to be taken by the Branch President, Lady Fielding, and the Rugby electrical engineer was to extend a welcome to the Branch.

On Thursday, October 4th, the Manchester Branch had a successful opening meeting at which over 100 members were present. Mr. Llewelyn B. Atkinson addressed the meeting on the "Electricity Act, 1926"; he first outlined the early legislation, and then emphasised the fact that the Act could not cheapen the price of electricity in large cities like Manchester. He dealt with the opposition in some quarters to transmission lines, and suggested that it would be well to ask the objectors if they would prefer smoky factory chimneys, the abolition of which was what these transmission lines were helping to do. Lt.-Col. W. A. Vignoles, Dr. Ferranti, Mr. H. C. Lamb, Mr. L. Romero, Mr. J. S. Peck, and Mrs. H. C. Lamb also addressed the meeting.

Two very successful meetings were recently held in connection with the inauguration of a North Wales branch of the E.A.W., at Wrexham, on October 5th, and Llandudno on October 6th, the chairs being occupied by Alderman E. Hughes and Mrs. Price White, respectively. The objects of the Association were explained by Miss C. Haslett. Dr. S. Z. de Ferranti also addressed the meetings, and the following officers were elected: President, Mrs. G. Z. de Ferranti; chairman, Mrs. Price White; hon. treasurer, Mrs. E. H. Paton; hon. secretary, Mrs. E. H. Klitz, Tan-yr-allt, Llanddulas, Denbighshire.

An Electric Pumping Station.

In order to relieve the main sewers of storm water in cases of emergency, an electrically-equipped pumping station has been erected at Nuneaton under the joint supervision of the borough surveyor, Mr. R. C. Moon, A.M.Inst.C.E., and Mr. S. Cameron Gibson, M.I.E.E., borough electrical engineer. Five pumps are installed, two of 120 h.p., two of 45 h.p., and one 25 h.p., and are capable of dealing with a total of 3,500 cu. ft. of water per min. The pumps installed were built by Messrs. Gwynnes Pumps, Ltd., and the driving motors, h.p. and l.p. switchgear, and motor control gear were manufactured and supplied by the General Electric Co., Ltd. The station consists of a 34-ft. deep pump-chamber for the centrifugal pumps, an electricity supply sub-station, and a superstructure of brickwork and masonry. The incoming electricity supply is taken from the Leicestershire and Warwickshire Power Co. through three-phase, 6,600-V Corporation mains. A special cable was laid in the bed of the river for this supply, and this is controlled by a G.E.C. truck-type cubicle switchboard in the sub-station. The accompanying illustration is a general view of the sub-station, showing the two 200-kVA supply transformers, 6,600/440 V, and the 440-V unit-type ironclad switchboard which controls the circuits to the various pump motors. The motors are of the pipe-ventilated type, and a particular feature concerning them is that all the windings are impregnated, both before and after assembly, thus rendering them particularly suitable for withstanding the unfavourable conditions which exist in a pumping station. They are controlled by automatic contactor control panels, with push-button operation for the larger machines. The method of control, using automatic remotely operated contactor equipment, is extremely convenient, and the operation of the gear has proved thoroughly reliable in service.



Nuneaton Pumping Plant Sub-station.

Electricity Supply at Huddersfield.

In the description of the extensions at the Huddersfield electricity works in our last issue, the cost of the new plant was given as £120,000. Mr. J. W. Turner, borough electrical engineer, informs us that the figure is incorrect, and should read £60,000. It has been suggested that the reference to the English Electric Co., Ltd., as having designed and installed

the first machine of the 2-cylinder type at Bradford in 1925 might convey the impression that the first 2-cylinder turbine to be designed and installed in this country was at Bradford in 1925; this, of course, is not the case, as there were 2-cylinder machines running in this country several years before the one mentioned.

Electrical Power Engineers' Association.

Under the operation of the "National Technical Groups" scheme of the Electrical Power Engineers' Association, a lecture syllabus has been organised for the winter session, which opened on Tuesday last in London with a lecture by Mr. Theodore Stevens, M.Inst.C.E., on "Railway Electrification." Other London fixtures are as follows: October 23rd, "Furnace Construction," by Mr. C. H. Sparks; November 13th, discussion on a.c. and d.c. distribution, opened by Mr. H. Blades; November 27th, "Low-temperature Carbonisation," by Dr. A. T. de Mouilpied; and December 11th, "Operation of Transformers," by Mr. S. A. Stigant. The Manchester Local Group commenced operations yesterday with a lecture on Modern Metering Practice," by Mr. E. Fawssett, M.I.E.E., and on December 13th Mr. M. Höchstädter will lecture on "Super Tension Cables." The Glasgow Group will hold its inaugural meeting on October 19th (all engineers are invited to attend), and on December 14th there will be a lecture on "Tariffs and Meters" by Mr. G. H. Sammons. Further arrangements have been made for the remainder of the session, and will include a visit to the E.L.M.A. headquarters in London, at which a lecture on "Modern Illumination" will be given.

Refuse Disposal Plant at Inverness.

The Town Council has submitted plans to the Dean of Guild Court for the erection of a refuse disposal plant at a cost of £15,000.

Educational.

University of London, King's College.—A course of nine public lectures will be given on "The Indebtedness of Industry to Pure Science" on Wednesdays at 5.30 p.m., commencing on October 17th with an introductory lecture by Sir Oliver Lodge, D.Sc., F.R.S. The subjects on following Wednesdays will be chemistry, electricity, the human factor, physiology, electrical communication, zoology, botany, and geology. Admission is free, without tickets.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. Walter J. Bache, M.I.E.E., the new chairman of the Western Centre of the Institution of Electrical Engineers, who delivered his inaugural address on Monday evening last at Bristol, received his technical training at Faraday House, London, and as a pupil at the Madrid and Leeds Electricity

Debenhams Longman] *[Cheltenham.*

Mr. W. J. Bache,
Chairman of the Western Centre of the I.E.E.

Works. On the completion of his pupilage at the latter station he was appointed on the staff of the late Mr. Harold Dickinson, who was then chief engineer. Amongst Mr. Bache's early duties were to assist in running the 20-h.p. semi-portable set which at that time comprised the Leeds generating plant. In 1899 he was appointed engineering clerk of works during the erection of the Gloucester Electricity Works, under the late Mr. Robert Hammond, and on the completion of the works he was appointed city electrical engineer. In 1905 the Cheltenham Town Council appointed Mr. Bache to be its borough electrical engineer, and since then he has carried out all extensions and additions to the undertaking. One of the pioneer undertakings, Cheltenham commenced supply in 1895 with a single-phase alternating current system at a frequency of 83 cycles, which was later changed to 100 cycles. The Corporation has recently contracted to take a bulk supply from the Stourport station of the Shropshire Power Co., and Mr. Bache is now occupied in arranging for the change of the single-phase 100 cycle system to 3-phase 50 cycles.

On October 1st the address of the Central England office of the Central Electricity Board was altered, and all communications for Mr. S. T. Allen should in future be addressed to him as follows: Central England Engineer, Central Electricity Board, Quality House, 25, Temple Row, Birmingham.

Mr. R. Humphries, who has been for many years engineer to the Birmingham and Midland Tramway Undertakings, has been appointed Southern Division mains engineer to the Shropshire, Worcestershire and Staffordshire Electric Power Co., with offices at Lloyd's Bank Chambers, Evesham. He will be glad to receive catalogues, &c.

Major Herbert Bell, M.I.E.E., the general manager of the Glasgow Corporation Electricity Department, entered upon his new duties on October 1st. Accompanied by Bailie Higgins, convener of the Electricity Committee, Councillor Holmes, sub-convener, and Mr. J. L. Mackenzie, senior town clerk depute, Mr. Bell was introduced to the principal officials of the department.

On the occasion of his marriage on September 27th to Miss Jessie Hargreaves, Mr. Harold Rawson was presented with a mahogany barometer by the maintenance staff of the Lancashire Electric Power Co., Radcliffe.

Seaham Harbour Urban District Council has, on the recommendation of the Electricity Committee, increased the salary of Mr. H. Adam, electrical engineer and manager, from £350 to £400 per annum, as from September 1st.

Information is to hand from the Institution of Engineers, India, to the effect that the Viceroy's prize for the year 1926-27, which is the highest award given by the *combined* engineering professions in India, was awarded to Mr. A. Lennox Stanton, M.I.Mech.E., M.I.E.E., &c., for his paper on "Railless Traction." It is interesting to recall that the Indian Prize of the Institution of Electrical Engineers (London), for the year 1922-23 was awarded to Mr. Stanton for his paper on "Railway Electrification."

Mr. Matthew W. Barr, Bonnybridge, has been appointed, out of 93 applicants, resident engineer for the Wick electric lighting scheme.

Mr. P. H. Cull has resigned his position as sales engineer to the Sevenoaks & District Electricity Co., Ltd., and has taken up the post of contract and sales manager with the East African Power & Lighting Co., Ltd., with headquarters at Nairobi, Kenya Colony.

Councillor George Saxon, J.P., chief costs clerk with the Tudor Accumulator Co., Ltd., of the Dukinfield Hall Works, has accepted the mayoralty of Dukinfield for the ensuing year.

Obituary.—Mr. H. J. Hall.—We regret to learn that Mr. Harold John Hall, chief engineer manager of the Electric Street Lighting Apparatus Co., of Canterbury, died suddenly on October 4th, at the age of 31 years, from complications arising

from malaria contracted in Palestine and Egypt during war service. Mr. Hall was a nephew of Mr. Haydn T. Harrison.

Sig. Pietro Cavalli.—The death recently occurred at Piacenza, Italy, at the age of 68 years, of Signor Ing Pietro Cavalli, a leading Italian authority on the construction of hydro-electric power stations.

Mr. F. G. Coombes.—The death has occurred at his residence at Coventry, at the age of 43 years, of Mr. Frederick George Coombes, A.M.I.E.E. He joined the testing department of the British Thomson-Houston Co., Ltd., at Rugby in 1907, and from 1909 to 1912 was on the firm's outside testing staff in the London area. He was then appointed chief of the general testing department at Coventry, and, after being transferred to the engineering department in 1915, he was appointed in 1922 personal assistant to the engineer and manager of the Coventry Works.

Mr. S. Ponsford.—Mr. Septimus Ponsford, A.M.I.E.E., of Ponsford & Co., electrical engineers, Dundee, passed away at his residence at Broughty Ferry, on October 2nd at the age of 59 years, after a brief illness from pneumonia. Mr. Stephen J. Ponsford, his son, was associated with him in the business.

Mr. A. T. Turney.—With much regret we have to announce the death, from heart failure, on the 5th inst., of Mr. Albert Thomas Turney. In the late seventies Mr. Turney was demonstrating that now-forgotten dupli ating appliance, the Edison electric pen, under the auspices of Col. Gouraud. On the invention of the telephone his attention was diverted to its development. He was concerned with the introduction of the telephone in London, Manchester, and other cities. When the Edison Telephone Co. was well started he joined the staff of the International Bell Telephone Co., visiting many cities on the Continent, and spending several years in St. Petersburg. In the late 'eighties he joined the London staff of the Western Electric Co. (now the Standard Telephones and Cables, Ltd.), specialising in cable work. After an unrivalled practical experience in the manufacture and use of lead-covered cables, he continued to represent the company on the sales side until his retirement a few years ago. He was held in high esteem by all with whom he had business relations, and his loss will be deplored by a wide circle of friends. Mr. Turney, who was in his 76th year, passed away at The Orchard, Elms Lanes, Sudbury, Middlesex. The remains were cremated at Golders Green on Tuesday morning. In addition to members of the family, there were present Mr. L. B. Atkinson, representing the Cable-Makers' Association, Mr. H. W. Kolle, Mr. Martin (Standard Telephones, Ltd.), and a large number of his other old colleagues and friends.

Wills.—The late Mr. E. Cox-Walker, of Darlington, left £4,233 gross, and £2,688 net personalty.

Mr. W. A. Chamen left £4,485 gross and £4,252 net personalty.

Mr. J. W. L. Buckley, tramways permanent-way superintendent, Leeds, left £18,500 gross, and £17,699 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Symphony Gramophone and Radio Co., Ltd.—Public company. Registered October 5th. Capital, £200,000 in 2s. shares. Objects: To carry on the business of manufacturers, repairers, importers, exporters of or dealers in gramophone records, gramophones, amplifiers, loud speakers, pianos, automatic machines, &c., and to adopt an agreement with H. C. Willson. The first directors are: Col. Sir A. R. Holbrook, K.B.E., D.L., M.P., 19, Porchester Square, W.2, chairman (chairman Holbrook & Son, Ltd.); Sir George Rawson, M.P., Courtenay House, Hove (chairman Durax, Ltd.); C. W. Hayward, Rosedale, Dunstall Road, Wolverhampton (joint managing director A. J. Stevens & Co. (1914), Ltd.; W. G. H. Jenkinson, 50, Stamford Road, Handsworth, Birmingham, mechanical engineer; W. S. Stephenson, M.C., 143, Harley Street, W., managing director (director of Electric & General Industrial Trusts, Ltd.). Secretary and registered office (*pro tem*): J. A. Harris, 1, Cornhill, E.C.3.

J. H. Holmes & Co., Ltd.—Private company. Registered October 3rd. Capital, £100,000 in £1 shares. Objects: To acquire the business of electrical and general engineers hitherto carried on at Newcastle-upon-Tyne and elsewhere as J. H. Holmes & Co., together with the goodwill, trade marks and patents and all or part of the assets, and to carry on this business and that of electricians, manufacturers of and dealers in apparatus, appliances and machinery used in connection with generation, distribution, supply, storage and utilisation of electricity, &c. The subscribers (each with one share) are:—H. W. J. Vertigan, 29, North Avenue, Gosforth, Newcastle-upon-Tyne, company secretary; L. H. Booth, Pilgrim House, Newcastle-upon-Tyne, solicitor. The first directors are to be appointed by the subscribers. Solicitors: Watson, Burton, Booth & Robinson, Pilgrim House, Newcastle-upon-Tyne.

H. A. McQueen & Co., Ltd.—Private company. Registered in Edinburgh October 1st. Capital, £10 000 in £1 shares (8,000 6 per cent. cumulative participating preference and 2,000 ordinary). Objects: To carry on the business of electrical engineers, manufacturers of switchboards, electrical appliances, &c. The directors are:—H. A. McQueen, 182, West George Street, Glasgow, electrical engineer; R. Forrest, 370, St. Vincent Street, Glasgow, engineer; J. Davidson, Auchenheath House, Lanarkshire, chartered accountant; G. Hamilton, Morrisfield, Larkhall, cashier; J. Davidson, jun., Auchenheath House, Lanarkshire, chartered accountant; G. Hamilton, jun., Morrisfield, Larkhall, engineer. Registered office: 190, West George Street, Glasgow.

Atomlite (Parent Company), Ltd.—Private company. Registered October 4th. Capital, £10.000 in 9,500 ordinary shares of £1 each and 10,000 deferred shares of 1s. each. Objects: To acquire from J. R. Robertson the benefit of certain inventions, and to carry on the business of electricians, electrical and mechanical engineers, manufacturers, importers and exporters of, agents for and dealers in electrical, magnetic, galvanic, electrotherapeutic and other apparatus, &c. The permanent directors are:—J. A. Vielle, 65, London Wall, E.C.2 (director Indemnity Service, Ltd., and Eviana Syndicate, Ltd.); J. R. Robertson, Morley House, 322, Regent Street, W.1. Registered office: 322, Regent Street, W.1.

M. W. Woods, Ltd.—Private company. Registered October 3rd. Capital, £5,500 in 5,000 7 per cent. cumulative preference shares of £1 each and 5,000 ordinary shares of 2s. each. Objects: To acquire the business of an electrical and general engineer now carried on by M. W. Woods at Denmark Street, Colchester as "M. W. Woods." The directors are:—M. W. Woods (permanent governing director and chairman), C. H. Woods, and M. G. Woods, all of Denmark Street, Colchester. Solicitors: Sparling, Son & Benham, 5, West Stockwell Street, Colchester.

East Sussex Wiring Co., Ltd.—Private company. Registered September 28th. Capital, £1,000 in £1 shares. To carry on business as electrical wiring contractors, suppliers and vendors of electric light, heat and power installations and fittings, electricians, mechanical engineers, &c. The first directors are: D. W. H. Murton-Neale, The White House, Hawkhurst, Kent, solicitor; F. R. Payne, 50, Southway, N.W.11 (director of the Radielle Co., Ltd.); S. R. Dennis, "Coquimbo," 20, Penwortham Road, Sanderstead, Surrey (director of Cranbrook District Water Co.). Registered office: The Hill, Cranbrook, Kent.

Montague Radio Inventions and Development Co., Ltd.—Private company. Registered October 4th. Capital, £1,500 in £1 shares. Objects: To carry on the business of manufacturers and importers of and dealers in radio apparatus, electrical equipment, mechanical appliances for the transmission of pictures—both still and moving—and with or without wires, and gramophones, electricians, mechanical engineers and manufacturers, &c. The first directors are:—S. Montague and D. Montague, 126, Walm Lane, Cricklewood, N.W. Registered office: Empire House, 117-9, Regent Street, W.1.

Caersws Electric Supply Co., Ltd.—Public company. Registered October 5th. Capital, £2,300 in £1 shares. Objects: To carry on at Caersws and elsewhere the business of an electric light company in all its branches. The subscribers (each with one share) are:—S. J. Sulston, 32, Deal Road, S.W.17, incorporated secretary; W. L. Lee, 24, Genesta Road, Westcliff-on-Sea, articled clerk; and five other clerks. The first directors are not named. Registered office: The Laurels, Caersws, Montgomeryshire.

Neetram, Ltd.—Private company. Registered September 29th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of, agents for, and dealers in all kinds of materials, devices, apparatus, implements, accessories or other goods used in connection with electricity; electrical

engineers, electricians, public works contractors, &c. The subscribers (each with one share) are: Bessie M. Hill, 5, Nursery Road, Southgate, N.14, clerk; J. W. Plimsoll, 65, Maldon Road, Acton, W.3, clerk. The first directors are to be appointed by the subscribers. Registered office: 29, Theobalds Road, W.C.1.

Matchless Radio Manufacturing Co., Ltd.—Private company. Registered October 1st. Capital, £500 in £1 shares. Objects: To carry on the business of electrical and radio engineers, formerly carried on by R. Davidson at 341, Goswell Road, E.C., and that of manufacturers of and dealers in electrical, musical and radio instruments, &c. The first directors are: Mrs. S. Davidson, 538, Commercial Road, Stepney, E.1; H. Vardill, 13, Fitzgerald Avenue, East Sheen, managing clerk. Secretary: W. Lecoyte, 20, Alton Road, Islington. Registered office: 341, Goswell Road, E.C.1.

James Marston, Ltd.—Private company. Registered October 5th. Capital, £100 in £1 shares. Objects: To carry on the business of dealers in musical and sound producing instruments, bicycles, motor cars and cycles, wireless receiving and transmitting sets, dynamos, electric lamps and fittings, electrical supplies, &c. The directors are: Mrs. Isabella Scudamore and J. A. Scudamore, 46, Sandown Avenue, Westcliff-on-Sea. Registered office: 161, High Street, Southend, Essex.

Official Returns of Electrical Companies.

Bournemouth and Poole Electricity Supply Co., Ltd.—Capital, £1,300,000 in 75,000 4½ per cent. cumulative preference, 175,000 6 per cent. cumulative preference, 150,000 new preference, 760,000 ordinary, and 140,000 unclassified shares of £1 each. Return dated May 24th, 1928. 75,000 4½ per cent. preference, 175,000 6 per cent. preference, and 720,000 ordinary shares taken up. £550,000 paid on the 4½ per cent. preference, the 6 per cent. preference, and 300,000 ordinary shares. £420,000 considered as paid on 420,000 ordinary shares. Mortgages and charges, £187,500.

Calcutta Tramways Co., Ltd.—Capital, £1,400,000 in 700,000 preference and 700,000 ordinary shares of £1 each. Return dated June 19th, 1928. 250,000 preference and 700,000 ordinary shares taken up. £764,900 paid (being £1 per share on the preference and 409,100 ordinary, 8s. per share on 22,000 ordinary, 10s. per share on 40,000 ordinary, and 14s. per share on 110,000 ordinary shares), £185,100 considered as paid (being 12s. per share on 22,000 ordinary, 10s. per share on 400,000 ordinary, 6s. per share on 110,000 ordinary, and £1 per share on 118,900 ordinary shares). Mortgages and charges: £350,000 4½ per cent. first debenture stock, and £239,500 7 per cent. 2nd (reg.) debentures.

Cutting Bros. & Co., Ltd.—Capital, £22,000 in 12,500 first preference, 7,500 second preference, and 2,000 ordinary shares of £1 each. Return dated June 18th, 1928. 12,000 first preference, 4,550 second preference, and 600 ordinary shares taken up. £10,000 paid on 10,000 first preference shares. £7,150 considered as paid on 2,000 first preference, 4,550 second non-cumulative preference, and 600 ordinary shares. Mortgages and charges, £10,000.

General Electric Co., Ltd.—Capital, £6,000,000 in £1 shares (1,800,000 "A" preference, 1,800,000 "B" preference, and 2,400,000 ordinary). Return dated July 17th, 1928. 1,800,000 "A" preference and 1,800,000 "B" preference, and 2,253,645 ordinary shares taken up. £4,831,819 paid on 1,575,540 "A" preference, 1,777,109 "B" preference, and 1,479,170 ordinary. £1,021,826 considered as paid on 224,460 "A" preference, 22,891 "B" preference, and 774,475 ordinary shares. Mortgages and charges, £3,244,660.

Anglo-Argentine Tramways Co., Ltd. — Capital, £11,000,000 in 800,000 1st preference and 710,000 2nd preference shares of £5 and 862,500 ordinary shares of £4 each. Return dated July 17th, 1928. 640,000 1st preference, 610,000 2nd preference, and 675,000 ordinary shares taken up. £850,000 paid, £8,100,000 considered as paid. Mortgages and charges: £70,660 annuity; £4,465,674 4 per cent. debentures; £1,733,380 4½ per cent. debentures, and £6,000,000 5 per cent. debentures.

Instrument Wires and Cables, Ltd.—Particulars filed of £2,500 debentures authorised September 1st, 1928, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Bray, Markham & Reiss, Ltd.—Capital, £20,000 in £1 shares. Return dated January 13th (filed May 17th), 1928. 17,080 shares taken up. £16,080 paid. £1,000 considered as paid. Mortgages and charges nil.

Fluor Light, Ltd.—Capital, £1,000 in 10s. shares. Return dated December 31st, 1927 (filed September 24th, 1928). 403 shares taken up. £201 10s. paid. Mortgages and charges nil.

Western Electric Co., Ltd.—Capital, £100 in £1 shares. Return dated April 11th, 1928. All shares taken up. £100 paid. Mortgages and charges nil.

Oriental Telephone and Electric Co., Ltd.—Capital, £900,000 in £1 shares (600,000 ordinary and 300,000 preference). Return dated June 5th, 1928. 428,941 ordinary and 188,791 preference shares taken up. £338,660 10s. (including £12 10s. on 50 ordinary shares forfeited) paid on 149,857 ordinary, and 188,791 preference, £279,084 considered as paid on 279,084 ordinary shares. Mortgages and charges: £133,023.

Robinson & Hands Electrical Co., Ltd.—Capital, £5,000 in £1 shares (4,980 preference and 20 ordinary). Returns of allotment made up to March 22nd and June 8th, 1928, show 4,232 preference and 20 ordinary shares allotted for cash. Mortgages and charges, nil.

Hooper's Telegraph and India Rubber Works, Ltd.—Capital, £50,000 in 1,000 preference and 4,000 ordinary shares of £10 each. Return dated July 3rd, 1928. All shares taken up. £40,000 paid, £10,000 considered as paid. Mortgages and charges, nil.

Sloan Electrical Co., Ltd.—Capital, £60,000 in £1 shares (10,000 preference and 50,000 ordinary). Return dated June 20th, 1928. 8,000 preference and 40,000 ordinary shares taken up. £41,500 paid. £6,500 considered as paid. Mortgages and charges nil.

Shoreham and District Electric Lighting and Power Co., Ltd.—Issue on September 29th, 1928, of £600 second debentures, part of a series already registered.

Bedale and District Electric Supply Co., Ltd.—Satisfaction in full on September 25th, 1928, of debentures dated May 16th, 1927, securing £2,000.

Burnham and District Electric Supply Co., Ltd.—Satisfaction in full on August 24th, 1928, of debenture dated July 8th, 1918, securing £2,000.

City Notes.

Crompton Parkinson, Ltd.

The *Financial Times* reports that arrangements have now been completed whereby a block of the deferred ordinary shares are made available. The whole of these have been held privately by Mr. F. Parkinson and Mr. A. Parkinson, and it is a condition of the terms of sale that a portion of the shares shall be available for purchase by holders of the preferred ordinary shares. Prior to the marketing, the deferred ordinary capital, which consisted of 50,000 shares of £1 each, will be subdivided into 200,000 of 5s. each. Further, by means of an increase of capital and capitalisation of reserves, a further 200,000 deferred ordinary of 5s. each will be created and distributed fully-paid to present holders. The voting power of the deferred ordinary will then be one vote per share. The price of the shares reserved for preferred ordinary shareholders (subject to permission to deal being granted) is 19s. 3d. net per fully-paid share of 5s. Steps will be taken at an early date to alter the names of the existing classes of shares. The present names are 8 per cent. cumulative preference (£170,725 paid); 6 per cent. cumulative preferred ordinary (£326,769 paid); and deferred ordinary (£50,000 paid). The new denominations will be: 8 per cent. cumulative first preference, 6 per cent. cumulative second preference, and ordinary. No alteration in rights or privileges is involved in this proposal.

Agricultural and General Engineers, Ltd.

The profit of the companies of this group for the year ended March 31st last amounted to £471,119, as compared with £430,257 for 1926-27. After providing for depreciation, taxation, &c., there was a net surplus of £53,945, against £13,310. The total revenue of the parent concern was £90,309, against £58,008, and the net balance £35,840, as compared with £4,013. A balance of £103,185 (against £67,346) is carried forward.

Marconi International Marine Communication Co., Ltd.

The directors have declared an interim dividend of 7½ per cent., actual, less tax (against 4 per cent. last year), and they state that the estimated profits for the year will enable them to declare a final dividend of the same amount. This will make a total of 15 per cent., as compared with 12½ per cent. last year.

Mexican Light and Power Co.

The dividends in respect of the half-year ending October 31st have been declared on the 7 per cent. cumulative preference shares and the 4 per cent. cumulative redeemable second preference shares.

Oriental Telephone and Electric Co., Ltd.

An interim dividend of 4 per cent. has been declared on the ordinary shares, free of tax. The directors have decided to offer on January 1st next to ordinary shareholders the right to subscribe at par for one new ordinary share for each three ordinary shares then held.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Wireless Pictures (1928), Ltd.—250,000 shares of 4s. each fully paid, Nos. 1,425,001 to 1,675,000.

Application has been made to the Committee to allow the following to be officially quoted:—

British Columbia Electric Railway Co., Ltd.—£966,103 deferred ordinary stock.

Tokyo Electric Light Co., Ltd.—£4,500,000 6 per cent. first mortgage bonds (sterling series) scrip fully paid.

The undermentioned have been ordered to be officially quoted:—

Shawinigan Water & Power Co.—317,000 shares of common stock of no par value.

Underground Electric Railways Co. of London, Ltd.—6,446 ordinary shares of £1 each fully paid, Nos. 5,701,378 to 5,707,823.

Ruths Steam Storage, Ltd.

The directors propose to increase the capital to £500,000 by the creation of 200,000 £1 "A" ordinary shares. These will be issued to the present holders of "A" ordinary shares in the proportion of one new share to each four held, at 25s. per share. This will absorb about 70,000 of the shares. A further 80,000 will be disposed of at a similar or higher price to two or more commercial and financial groups. The rights of the two classes of ordinary shares are to be altered. The new arrangement will provide that 90 per cent. of the amount available for distribution will be applied in payment of dividend upon the "A" shares, and the remainder in payment of dividend upon the "B" shares. Each "B" share will carry 19 votes instead of 11 as at present, maintaining the voting power of this class equal to that of the "A" shares. The new capital is required, *inter alia*, to finance separate companies for the development of the American and Canadian rights.

New Issue.

Particulars of the registration of the *Symphony Gramophone and Radio Co., Ltd.*, are given in our "New Companies" section to-day. On Monday last the company issued a prospectus offering for subscription 1,750,000 shares of 2s. each at par. Of the balance of the shares (250,000), 150,000 are allotted as fully-paid to the vendor of certain rights, while the underwriters have an option on 100,000 at 2s. 6d. per share. The prospectus states that "it is the intention of the company to specialise in the production of radio-gramophones which the trend of trade indicates will rapidly displace both existing types of instrument." These instruments will be capable of use as gramophones or radio receivers and, in addition, will be fitted with electromagnetic pick-up devices.

Ferranti, Ltd.

The net profit for the year ended June 30th last was £56,798, as compared with £35,982 for 1926-27. To this a balance of £36,020 brought forward is added, making £90,636. After meeting the preference dividends and transferring £35,000 to reserve (making £270,000), it is proposed to pay again an ordinary dividend of 20 per cent. free of tax, and to carry forward £34,116. Considerable extensions to buildings and plant were made during the year, and the balance of the first mortgage debenture stock was paid off. The meeting is to be held in London on October 18th.

Shawinigan Water and Power Co.

It is announced that the directors have decided to distribute a bonus in the form of no-par-value shares of the company to shareholders registered on October 12th in the proportion of one new share to each ten held.

Marconi's Wireless Telegraph Co., Ltd.

In view of the statement issued by the board on August 3rd concerning the proposed merger with the cable companies and at the instance of an influential body of holders of £1 ordinary shares, a committee has been formed for the purpose of concerted action if necessary. The committee consists of the Hon. W. B. L. Barrington, chairman (Helbert, Wagg & Co., Ltd.), Mr. B. H. Binder (Binder, Hamlyn & Co.), Mr. S. R. Cooke (Rowe & Pitman), and Mr. H. A. Vernet (Robert Benson and Co., Ltd.), with power to co-opt. Messrs. Binder, Hamlyn and Co. will act as secretaries to the committee.

North Metropolitan Electric Power Supply Co.

An interim dividend of 4 per cent. has been declared on the ordinary shares as last year.

Stocks and Shares.

MONDAY EVENING.

STOCK Exchange business continues to be on a substantial scale, and although the activity comes somewhat by fits and starts, the general volume of animation is well maintained. The public are gambling in all sorts of highly speculative issues, in respect of which only the future can show whether prospectus estimates are ever likely to be achieved. The coldly-austere say that there must come that day of reckoning when people will realise the folly of putting money into risky shares. It is, in point of fact, generally agreed that there will be a time when a proportion of the present popular favourites will prove practically unsaleable at any price. Meanwhile the speculator has made a good deal of money, and the business of stagging new issues is widely spread throughout the country.

As we mentioned last week, the prices of shares in good-class companies are not much affected by the speculative fever. In most of the industrial departments the tendency is for quotations to improve—evidence that good stock is not being turned out in any noticeable quantity, in spite of the necessity for raising funds with which to finance commitments in more hazardous enterprises.

Cable and Wireless.

The Eastern quartette of cable stocks and shares has shown a little tiredness, after its remarkable strength of the past two or three weeks. Prices are easier, though the declines are negligible when compared with the previous advances. The disposition at the moment is to await some fresh step towards the complete amalgamation of the wireless, cable and the beam systems. The Labour Party make no secret of their animosity to the proposal; but, the Government having gone so far as to accept the recommendations of the Imperial Wireless and Cable Conference, it is considered that for all practical purposes the scheme, with its two branches of the Merger Company and the Communications Company, will be duly legalised. On the strength of this, Marconis have been given a further run, and the more exuberant of the optimists declare that between 87s. to 92s. lies the price at which the shares should stand when the Marconi Company shareholders receive their proportion of stocks in the new undertakings. The shares, after having been up to 77s. 6d., reacted to 75s., and the company's £1 shares fell to 4¼.

The Marconi Marine Company has declared an interim dividend of 7½ per cent., comparing with 4 per cent. a year ago. The directors intimate that the dividend for the full year will probably be a minimum of 15 per cent., as against 12½ per cent. in the previous period. News of this intention leaked out in advance of the announcement, and, consequently, when the latter was made, profit-taking sales ensued on the part of those who had got in earlier. The price, from 57s., went back to 55s., leaving a loss of 1s. on the week. Canadians are dull at 29s.

Electricity Supply.

County of London ordinary at 38s., and Bournemouth and Poole at £3 have each fallen 2s. 6d. In the case of the former, it was suggested in the market that Counties had been bought by speculators who, seeing now a handsome profit on their purchase-price, were letting go these shares in favour of other industrials. Bournemouth and Poole are probably subject to similar influences. No other changes of importance have occurred in the lighting list. A fresh accession of buying of Electric Supply Corporation shares has lifted the price to 55s. 9d., which is 2s. 6d. up. The persistence of the support has led to suppositions that control of the company is being sought. Metropolitans keep at 47s.; Newcastle-on-Tyne are still 27s., to which the price reacted after its vivid rise on talk of inventions that will materially reduce the cost of electricity.

The Yields on Supply Shares.

Several thousand Westminster Electric ordinary shares are obtainable at 28s., and the seller points out that at this figure the yield on the money is £6 5s. 9d. per cent. until 1931. This is calculated on the assumption that the dividend at present being distributed, 8.8 per cent., will be maintained, as seems fairly assured. In our own price-lists it will be noticed that the yield per cent. is worked out as being £5 3s. 8d., at 27s. The latter yield is based on the 7 per cent. dividend to which the Westminster Electric, in company with the other London undertakings, will be restricted after 1931. Some statisticians endeavour to arrive at a mathematically correct return per cent., taking the date-factors into consideration, but this, it seems to us, is difficult to state dogmatically in view of the possibilities that lie ahead. Therefore, may it be repeated that, while the yields of the London electricity companies' ordinary shares are actually higher at the present time than those given in our lists, the latter, worked out on the probable post-1931 dividends of 7 per cent., represent the income per cent. that the share buyer of to-day must anticipate.

1928-1931.

London Electric Supply may be quoted as another instance in the same category. There are 500 ordinary shares obtainable at 27s. 9d. The company is paying a few decimal points under 8¼ per cent., and, on this basis, the return is £6 0s. 6d. In our lists the yield is calculated as being £5 1s. 10d. per cent. City of London Electric ordinary, purchasable at 33s., pay £6 1s. 3d. per cent. until 1932, and Charing Cross ordinary at 27s. 9d. give £5 17s. 6d. until the same year. The County of London and the Metropolitan Electric Supply Companies are on a footing rather different from the others. With Bourne-

mouth and Poole, any effort to work out the yield per cent. might prove to be misleading, in view of the capital rearrangement recently made.

Stocks and Shares Obtainable.

Amongst other shares now on offer, it may be useful to mention 5,000 Midland Counties ordinary at 31s., 500 Midland Electric Corporation for Power Distribution at 41s. 6d., 500 Northampton Electric ordinary at 43s. 6d. (paying 4½ per cent.), 500 Egham and Staines at 37s. (giving £4 1s. per cent.), 500 Shropshire, Worcestershire and Staffordshire ordinary at 38s. (yielding four guineas per cent.), and 1,000 Scottish Power new ordinary, issued at 26s., now 18s. paid, at 5s. 9d. pm. These last-named will return £5 0s. 9d. per cent. on the money, a partial dividend falling due in March next. About £5,000 River Plate Electric ordinary stock is available at 225, paying £4 17s. 9d. per cent., and £2,500 West London and Provincial Electric Trust ordinary stock at 194, carrying the dividend now due, and yielding £5 3s. per cent. on the money. Atlas Light & Power can be bought at 19s. 10½d., ex the October dividend, free of stamp and fee. The cumulative dividend shares cost 20s. 3d., and are subject to stamp-duty.

"Odd Lots."

It may have been noticed by people who have small and broken amounts of stock to sell that they are required to pay the transfer stamp and fee which, as everyone knows, is paid. in the ordinary way, by the purchaser. This happens as a rule in the case of an amount of stock under £100, or a handful of shares such as, for example, 7 or 12 or 26. The Stock Exchange jobber who buys, say, £59 stock, or 13 shares, knows that he is practically certain to have to take up these oddments, and to put them into his own name. The likelihood of his encountering a buyer of such Odd Lots, as Wall Street contemptuously calls them, is extremely remote. Therefore, as a condition of buying, he will do so "free of stamp and fee," which means that the seller pays the Government duty and the company's registration fee of half-a-crown. As already observed, this is done only in cases where small oddments are concerned, and the amount of cash involved by the stamp and fee is always very trifling. But where a client is not familiar with Stock Exchange practice, he frequently feels some sense of grievance at being debited with the stamp and fee on some little lot of stock sold, unless his broker writes and explains the reason.

Home Rails.

After being dull and depressed, the market for Home Railway stocks underwent a striking change, and prices advanced with briskness. Labour no longer was permitted to interfere with the Underground Electric issues. The income bonds rose 3 to 128, and the shares 1s. to 2?s. Metropolitan consolidated is a trifle easier, but the steam stocks have been going ahead in cheery fashion. Iron and steel descriptions also strengthened by reason of the greater hopefulness expressed in regard to the trade outlook. Vickers have not moved, but Armstrongs are better, along with a number of other low-priced shares which can be bought in large quantities with the expenditure of comparatively modest money. Tilling and British Automobile new ordinary shares of £1 each, with 14s. 6d. paid, are attracting attention at about 23s. 6d. British Electric Traction deferred is 10 points up, at 540.

Strength of Manufacturing Shares.

Manufacturing companies' shares are in favour, and a number of price improvements have occurred since last week. There are advances in Callender's, Henley's, Enfield Cable, both classes of Metropolitan-Vickers, and several others. Optimism runs high, in regard to the future, because of the contracts placed with Callender's and the General Electric Company by the Central Electricity Board. Crompton Parkinson preferred ordinary have strengthened to 18s. 6d. The recent dramatic rises in the cable and wireless group have encouraged the impression that when the amalgamations are duly completed, there is likely to be an actively progressive policy adopted by all the partners, who are expected to start upon developments so far held in check by the uncertainties that have surrounded the outlook. It is anticipated, in short, that the cable construction and the electrical equipment companies may look forward to several years of abundant and profitable business.

"Dollar Stocks."

Mexican utility stocks are unaffected by the declaration of the dividends on Mexican Light and Power 7 per cent. preference and the 4 per cent. redeemable second preference. The company's common shares, whose early return to the dividend list is anticipated, remain at 80½, which is only a dollar less than the price of the 7 per cent. preference. Brazilian Tractions dropped to 60, and rallied to 61¼. Montreal Light, Heat and Power shares are higher at 107¼, and Shawinigan common at 97¼ show a gain of 6 points. Pennsylvania Water and Power capital stock has lost 3, at 82½. American Telephone and Telegraph is down 2, to 183½.

Share List of Electrical Companies.

	Nom.	Dividend. 1926.	Dividend. 1927.	Price Oct. 8, 1928.	Rise or fall.	Yield. p.c.
Home Electricity Companies.						
Bournemouth and Poole	£ 1	14†	15	8	—½	... ...
Brompton Ordinary	1	8⅞	8½	27/-	—	5 8 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 8 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅝	8⅝	27/6	—	5 1 10
City of London	1	10	10	33/3	—	4 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	2	—	4 0 0
County of London	1	7½	7½	38/-	—2/6	3 19 0
do. do. 6% Pref.	1	6	6	23/6	—	5 2 2
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	55/9	+⅛	3 18 10
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	30/6	—	5 0 0
London Electric	1	8½	8½	27/6	—6d.	5 1 10
Metropolitan	1	8	9	47/-	—	3 16 9
do 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	31/-	—	4 3 10
Mid. Elec. Power	1	—	15	40/6	—	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	27/6	—	4 7 5
do. 7% Pref. ...	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10?/4	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	32/6	—	4 18 6
South London	1	8½	8½	27/6	—	5 2 8
Urban Ordinary	1	7	7	35/-	—	... ...
Westminster Ordinary	1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	23/9	—	5 6 4
Yorkshire Elec.	1	8	8	38/-	—	4 5 4
Home Rails.						
Central London Ord. Assented ...	Stock	4	4	72	—	5 11 1
Metropolitan	,,	3	3	66½	—½	4 10 3
do. District	,,	3½	4	79	—	5 1 3
Underground Electric	£1	1½	5	27/-	+1/-	3 14 1
do. do. Income ...	Bonds	6	6	128	+3	4 13 9
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	104	—	5 15 5
do. Def.	,,	1½	1½	24½	—	6 9 0
Automatic Telephone	1	10	10	43/9	—	4 9 0
Eastern Extension	10	10	10	25½	—¾	*3 18 6
Eastern Tel. Ord.	Stock	10	10	260	—2½	*3 17 0
Globe Tel. and T. Ord.	10	10	10	25⅝	—¼	*3 15 2
do. do. Pref.	10	6	6	11	—	5 7 10
Great Northern Tel.	10	20	20	38	—	5 5 3
Indo-European	25	10	10	47½	—	*5 5 3
Marconi	10/-	5	*10½	9⅞	—⅛	... ...
Marconi-Marine	1	8⅞	12½	55/-	—1/-	5 9 1
Oriental Telephone Ord.	1	12	12	57/6	—	*4 8 6
United R. Plate Tel.	5	8	8	9½	—¼	*4 6 6
Western Telegraph	10	10	10	25½	—¼	3 18 6
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	8⅜	—	7 11 9
do. do. 2nd. Pref. ...	5	6	6	8½	—	8 11 6
do. do. 5% Deb. ...	Stock	5	5	78½	—	6 7 5
British Electric Traction Def. Ord.	,,	—	—	540	+10	... ...
do. do. Pref. Ord.	,,	8	7½	125	—	6 0 0
Brazil Traction	100	6	7	61½	—	2 17 8
Brit. Colombia Elec. Rly. Pce. ...	Stock	5	5	90½	—	5 3 9
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/6	—	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 12 9
Mexico Trams, 5% Bonds	—	5	5	78	—	6 8 2
Mexican Light Common	100	Nil	Nil	80½	—	... ...
do. 7% Pref.	100	Nil	7	81½	—	8 11 10
do. 1st Bonds	—	5	5	76½	—	6 10 9
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...
Manufacturing Companies.						
Babcock & Wilcox	1	13	15	71/9	—	*4 4 3
British Aluminium Ord.	1	10	10	46/3xd	—1/9	*4 7 0
British Elec. Transformer Pref....	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4?/6	—	3 11 9
Brush Ord.	1	10	10	28/9	—	6 19 2
Callenders	1	15	15	4?/-	+1/3	3 11 10
do 6½% Pref.	1	6½	6½	1?	—	5 4 0
Crompton Parkinson Pref Ord. ...	1	—	6	18/6	+6d.	6 9 9
do. 8% Pref.	1	—	8	26/3xd	—	6 2 0
Edison-Swan	4/-	10	10	12/6	—	3 4 0
do. 5% Deb.	Stock	5	5	89½	—	5 11 9
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Ord.	1	20	20	4?	+⅛	4 9 0
English Electric	1	Nil	Nil	7/-	—	... ...
do. do. Pref	1	3	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	25/-	+6d.	5 4 0
do. Ord.	1	7½	10	41/6	—	4 16 5
Henley	1	25	25	5?	+1/8	4 5 0
do. 4½% Pref.	5	4½	4½	4?	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	12½	10	1?	—	5 6 8
Met.-Vickers Ord.	1	8	6	84/-	+9d.	3 10 7
do. Pref.	2	8	8	2?/-	+1/3	5 19 5
Siemens Ord.	1	7½	7½	1?	—	5 0 0
Telegraph Construction	12	10	10	24?	—	*4 18 6

*Interim.

*Dividends paid free of Income Tax.

†4% of which was tax free.

German Industry in 1927-28.

Progress in Electrical Export Trade.

THE Department of Overseas Trade has issued a report on "Economic and Financial Conditions in Germany" to June, 1928, the author being Mr. J. W. F. Thelwall, M.C., Commercial Counsellor at Berlin, with chapters contributed by Mr. C. J. Kavanagh, Commercial Secretary at Berlin. (Stationery Office, 3s. 6d. net.)

At the outset the report points out that the boom which began in the German home market in the second half of 1926 continued unabated into the first quarter of 1928, and striking evidence of intense activity is furnished by all sections of industry. This activity was initiated and maintained by a combination of foreign borrowing and the characteristic national energy. In industry it was manifested in the perpetual scrapping and renewal of plant, in extensions, in mergers, in the closing of one works and the regrouping of others; in short, in continual rearrangement and ceaseless striving after improvement. The syndicate or cartel movement in Germany was stationary during the period under review, and such changes as occurred were mostly in the nature of expansion and organisation of existing syndicates. Internationally, however, there was some development, as, for instance, in the chemical industry, artificial silk, and linoleum. With regard to Anglo-German trade the report states that the German market is one which is well worth watching; as wealth increases there will be a better demand for luxury articles of high quality, such as Great Britain specialises in; wages, and with them prices, are steadily advancing so that the chances of successful competition should occur with increasing frequency. It is suggested that particular attention should be paid to the possibility of opening up new business by granting advantageous credit terms, after proper investigation and under suitable safeguards, and the difference between the rates of interest in Great Britain and Germany is still so great that opportunities under this heading ought certainly to offer themselves.

By the end of the first quarter of 1928 the activity in the German home market is stated to have shown a distinct falling off, and this has continued. To a certain degree the smaller inland demand has been replaced by exports, but, in any case, German industry has grown sufficiently strong to resist a temporary setback without serious disturbance, the more so in the present instance, as it has long been realised that a change was bound to come, and dispositions were made accordingly. A matter which gives cause for concern is the trend of prices. If means are not found to check their upward movement it is considered that difficulties will certainly occur. At present wages increases and price advances follow each other with deadly regularity, and no effective steps for bringing about stability appear to have been thought of. The syndicates are not entirely blameless in the maintenance of unduly high prices. With the exception of a few which abuse their power this is due, however, not to the fact that they are combines, but that they are not close enough combinations, and so cannot always control production as well as prices. They often have to give undue consideration to their inefficient members whose prices are naturally too high and thus put up the level for the whole branch of industry concerned.

Concerning the foreign trade of Germany the report states that the excess of imports over exports in 1927 amounted to £196,000,000, but this leaves out of consideration the so-called "invisible" exports which may perhaps be put at about half of this excess. At the same time it is recalled that ever since 1870 Germany's imports have exceeded her exports. In 1913 Germany's foreign trade formed 13.3 per cent. of the world's commerce, and in 1927 it had recovered so far as to reach 10.8 per cent.

Dealing with the metallurgical and engineering industries, Mr. Kavanagh states that the steel industry has been able to place in operation the extensive additions which have been carried out in recent times. As a result of the concentrated efforts to build up the industry Germany has now practically equalised the extensive post-war losses of territory. The plant has everywhere been brought up to a very efficient pitch of perfection, not only in the iron and steel works themselves, but also in the transport and handling facilities. The manner in which the partnership of coal and steel has been directed and organised and the methodical way in which large industrial combinations have been operated has done much to secure for the industry a high standard of financial credit by which alone the vast measure of reconstruction has been made possible. On the question of industrial amalgamations the report says that the chief activity during the past year has been in the improvement and extension of the production apparatus within the iron and steel works themselves.

Electrical Production and Exports.

The report states that the machine construction branch of the engineering industry was exceptionally well employed during the whole of 1927, and although in the first quarter of 1928 activity somewhat decreased, more particularly in electrotechnical and textile machines, the industry is still well occupied. The greatest efforts have been made to enter foreign markets, in many cases at considerable sacrifice, and Germany now holds the second place to the United States among exporters of machinery. In 1927 the machinery exports amounted to 458,428 tons, and those of electrotechnical products, including cable, were 121,838 tons, whereas the imports were only 60,827 tons of machinery and 9,000 tons of electrotechnical products. The electrical industry was well employed during the whole of the year, and, despite a considerable increase in home sales, due to the general industrial activity and the increase in electrification, a larger share of export business was obtained than in the preceding year. The proportion of export sales to the total turnover advanced, for example, in the case of the A.E.G. to 36 per cent., as compared with 40 per cent. before the war, while the total turnover rose by 20-25 per cent. Although pre-war exports have not yet been attained, Germany is leaving nothing undone to recapture her former markets. The following table gives a comparison of the exports of the chief products in 1926 and 1927:—

Description.	1926. Tons.	1926. Value in 1,000 Mks.	1927. Tons.	1927. Value in 1,000 Mks.
Automobile lighting sets and starters	140	1,657	503	5,710
Dynamos, motors, and transformers—				
Up to 10 kg.	469	4,974	663	4,967
(*b*) 10 kg. to 25 kg. ...	393	2,223	596	2,591
(*c*) 25 kg. to 150 kg. ...	3,144	8,447	3,889	10,319
(*d*) 150 kg. to 500 kg. ...	2,752	7,038	3,537	9,130
(*e*) 500 kg. to 3,000 kg. ...	5,550	11,774	7,913	17,707
(*f*) over 3,000 kg.	8,661	13,575	8,621	15,070
Armatures and commutators	1,642	5,106	1,539	6,650
Metal filament lamps ...	910	20,305	1,026	25,898
Telephone apparatus ...	—	29,633	—	21,825
Wireless apparatus	2,902	31,636	3,541	41,983
Electrical meters and measuring apparatus ...	2,833	30,619	2,821	32,996
Ignition apparatus and electrical appliances for motor-cars	1,093	12,119	1,353	16,874
Apparatus for electric lighting, power transmission, &c.	19,759	68,102	24,239	85,381
Galvanic elements, batteries, &c.	5,340	10,714	6,373	13,093
Cables	47,127	54,893	42,596	40,662

For smaller dynamos the best markets were Holland, Denmark, Sweden, Switzerland, Great Britain and Czecho-Slovakia in order of importance; for the larger, Russia was the chief market, followed by Argentina and Holland, though exports were made to practically all countries. The chief markets for commutators were Russia, Argentina and Austria, and for telephone apparatus Italy and Holland.

Electricity Supply and Railways.

In the course of the part dealing with the development of the coal industry reference is made to the use of pulverised coal. The greatest development is in the new Berlin generating station at Rummelsburg, which has the largest pulverised-coal firing plant in Germany, and works practically exclusively on bituminous coal. The station has its own crushing plant, consisting of two beater mills, each with an output of 140 tons per hour, and the central pulverising plant consists of eight mills which are capable of powdering coal with a water content up to 12 per cent., each having a capacity of 12 tons per hour.

The industrial census of 1925 placed the power of primary electrical machines at 6,400,000 h.p., and that of electric motors at 12,900,000 h.p. For the first time the census returns included the private installations in industry and agriculture, in addition to the public supply companies. The total production in 1925 amounted to 20,300,000,000 kWh. which represented 325 kWh per head of the population. The number of steam engines and turbines, hydraulic turbines and water wheels, and engines driven by oil, gas or wind was 14,710 of a capacity of 8,853,080 kW, while the generators numbered 16,340, with a total capacity of 8,713,161 kW. The length of high-pressure transmission lines at the end of 1925 was 196,807 km. It is noted that public authorities own or control 76 per cent. of the electricity produced by public supply companies and 49 per cent. of the distributing stations.

Concerning legislation by the Government of the Reich for the production and distribution of electricity throughout the country, it is mentioned that most of the data which had been asked for had reached the Ministry for Economic Affairs

in September, 1927, and was to be sifted and collated for subsequent submission to the Government. The electrical interests of the Reich are concentrated in the Elektrowerke. The most important event of the year was the agreement reached by the Reich with Prussia respecting the areas to be supplied with electricity. This applies to the Prussian State Electricity Company, which has absorbed three State-owned undertakings and thus ensures a more efficient administration. The report also refers to the situation in Bavaria and other States, and then briefly mentions the position of the railways. At the end of 1927 the long-distance track electrically operated amounted to 1,107 km., while the town and suburban electrical lines reached 112 km. The electrical lines added during the year comprised 192 km. of long-distance track, mostly round Munich, and 21 km. of suburban line at Berlin, while 325 km. of line was being equipped at the close of last year.

The Fuel Conference.—III.

Proceedings at the Sectional Meeting of the World Power Conference held in London.

On Friday, September 28th, with Sir Charles Parsons, F.R.S., in the chair, Section J: Utilisation of Fuels for Steam Generation and the Production of Electricity, was the subject of the morning meeting; Mr. G. Stoney was the general reporter, and had 14 papers to deal with. This was one of the most important meetings of the whole Conference. Mr. Sloan's notable paper was fully abstracted in our last issue, and the discussion, which turned mainly on that paper, is reported elsewhere in this issue. The chairman, in opening the meeting, commented upon the importance of the subject to be discussed and said that the facts stated in Mr. Sloan's paper, which demonstrated that the by-products of a carbonisation process could be utilised for the purpose of the generation of electricity, were specially noteworthy in view of the fact that three-quarters of the electricity in the world was produced by steam generated by the burning of fuels and only one quarter by water power. In the afternoon, in Section K: Utilisation of Fuels, including Electricity for Industrial Furnace Work, Mr. George A. Orrok presided, and 18 papers were reported on by Mr. Roger T. Smith (vice-chairman). Six of the papers related to electrical heating, and contained valuable information regarding its industrial uses. One was presented by Mr. S. E. Monkhouse, on behalf of the British Electrical Development Association, and gave the results of an analysis of the heat used in works of various types, showing the proportion of it that was produced electrically—over 6 per cent. in engineering works. It was stated that though the cost of electric heating was greater than with fuel, the results were so satisfactory that its use was extending in Great Britain, especially in connection with heat treatment and tempering processes.

The Conference was resumed on Monday, October 1st, when Section L: Utilisation of Fuels, including Electricity, for Domestic Purposes, occupied the morning session. Sir Richard Threlfall, G.B.E., F.R.S., occupied the chair, and the general reporter was Dr. Margaret Fishenden, who also contributed one of the nine papers; her work under the Fuel Research Division of the Department of Scientific and Industrial Research has covered a wide range, and has proved of great value in connection with domestic cooking and heating problems. Incidentally, Dr. Fishenden was the only woman delegate to the Conference. Her paper shows that central heating is gaining ground, and the use of electricity and gas for heating is steadily expanding, it being realised in all countries that sound scientific methods of heating must be substituted for the wasteful methods that have hitherto prevailed. Although the efficiency of generation in the case of electricity is only 20 per cent., and in that of gas 50 per cent., the radiation efficiency of the electric fire is 75 per cent., and that of the gas fire 45 per cent., whilst that of coal is only 20 per cent.; hence, the use of gas or electricity for heating does not necessarily involve waste of our coal reserves. Other papers of electrical interest were submitted by Dr. A. Velisek (Austria), Viscount Shimpei Goto (Japan), Messrs. N. Ekwall and O. Stalhane (Sweden), and Mr. H. W. Derry (United States).

In the afternoon Section M: Pulverised Fuel was considered, Mr. Archibald Page being in the chair, with Mr. A. Grounds as general reporter. Ten papers were submitted, including one on "Pulverised Fuel Firing," by Mr. F. H. Rosencrants (Great Britain), and one on "The Function of the Combustion Chamber," by Dr. W. Lulofs (Holland). It was pointed out that much research work was needed in connection with many branches of this subject. The trend of practice is towards drying the fuel in the mill itself, and towards the adoption of the bin-and-feeder system rather than of direct firing, though the latter has its uses. The design of pulverised fuel plant is still in a state of flux. The dust nuisance suggests that ash should be eliminated from the fuel as far as possible before combustion. Pulverised fuel is used very widely in Russia, and in Bohemia excellent results have been obtained by pulverising very low-grade coal.

The only meeting on Tuesday was that of Section Q: Low-Temperature Carbonisation, under the presidency of M. Guillaume; three papers were submitted, and Mr. F. S. Townend was the general reporter. Dr.-Ing. P. Rosin (Germany) discussed the possibilities of co-ordinating coal processing and the production of electricity, and Drs. C. H. Lander and F. S. Sinnatt (Great Britain) dealt with low-temperature carbonisation, stating that there were 16 installations capable of treating 10 tons or more of coal each per day. The results of tests on eleven of these plants were given; the conclusion was drawn that whilst from the technical aspect low-temperature carbonisation was practicable, the results of long-period commercial operation must be awaited before its value as a real factor in national fuel utilisation could be appraised. With regard to its co-ordination with electricity generation, Dr. Rosin laid it down that co-ordination must lead to a lowering of the cost of the main product; one process must be dominant; the by-products must be used interdependently, and the economic weaknesses of the individual processes must be neutralised as far as possible. Co-ordination must clearly lead to cheaper electricity, but could only be economically practised in the case of lignites and non-coking coals, as had been done in Germany. The afternoon of Tuesday was devoted to visits to the Gas Light and Coke Co.'s works at Fulham, and to the Barking power station of the County of London Electric Supply Co., Ltd.

On Wednesday morning, the Conference dealt with Section O: Transmission of Power, under the chairmanship of Dr. C. Köttgen, Mr. F. S. Townend reporting on three papers. Two of the papers related to the transmission of gas; the third, by Dr. E. W. Smith, covered coal, oil, gas, and electricity. The author concluded that the cost per therm of transmitting electricity was, on the whole, much greater than that of transporting coal, oil, or gas—depending largely on the load factor and the system of distribution; hence there was every justification for extending the use of gas and coke. But there was a limiting distance beyond which it was cheaper to carry the coal. The reporter, summing up, pointed out that the considerations which led to the recent re-organisation of electricity supply in Great Britain did not operate in the same way with regard to gas, and that there were serious legal difficulties to

be surmounted before the bulk supply of gas became feasible. Section P: Waste Heat Recovery, was taken afterwards, two papers being submitted. Dr. S. Kasai (Japan), dealing with the cement industry, stated that in 18 of the 30 cement works in Japan, representing 80 per cent. of the total production, the normal output from so-called "waste" heat steam was no less than 54,000 kW, equivalent to a saving of 500,000 tons of coal per annum. Valuable information was contained in both papers, particularly with regard to the use of surplus heat for raising steam.

On Wednesday afternoon the subject was Section T: Training of Fuel Technicians; Sir Robert A. Hadfield, Bt., F.R.S., was in the chair, and the general reporter was Mr. E. C. Evans. Two papers were presented. Section V: Organisations Concerned with the Efficient Use of Fuel in Industry, followed, with three papers, explaining the schemes adopted in Great Britain, Germany, and Russia for organised fuel control.

On Thursday morning, October 4th, Section W: Economic Possibilities in the better Co-ordination of Fuel Utilisation, sat, with Sir David Milne Watson in the chair, Mr. T. C. Finlayson reporting on the two papers; in one of these, "A Fuel Policy," Sir Arthur Duckham, K.C.B., explained his proposals for securing the better utilisation of fuel. Both papers referred to the importance of co-ordinating coke ovens with steel works. In the afternoon visits were paid to the Fuel Research Station, the National Physical Laboratory, and the Anglo-Persian Oil Co.'s Laboratories.

Mr. D. N. Dunlop, chairman of the International Executive Council, presided at the concluding meeting. Dr. E. W. Smith—one of the technical secretaries—presented a general summary of the proceedings in the various Sections. For the most part this consisted of a brief account of what happened, but speaking of Section G, which dealt with the carbonisation industry, Dr. Smith said he regretted that the discussion on this subject was disappointing. Most of the speakers dealt with the supply of coke-oven gas to the gas industry of Great Britain, and the discussion left little doubt that the coal industry, through the coking industry, was looking to the gas industry to help it, by providing a suitable outlet for the surplus gas, to reorganise the coking plants on a profitable basis. As to Section M, which dealt with pulverised fuel, Dr. Smith said that the discussion was almost entirely limited to contributions from members of firms supplying the various types of equipment.

The various resolutions that had been passed by the Sections were formally confirmed, and the meeting concluded with votes of thanks to the authoritative bodies and authors of papers, to the chairmen and vice-chairmen of the various Sectional meetings, the general reporters, and to Mr. Dunlop and his staff, for the manner in which the organisation of the Conference had been carried out. Delegates of the participating countries addressed the meeting in appreciation of the manner in which they had been entertained, and specially cordial invitations were extended to the various countries to send delegates to the Sectional meetings in Barcelona and Japan next year, and to Berlin for the full Conference in 1930.

Mr. Dunlop in the course of a speech in which he dwelt upon the advantages, from the point of view of international relationships and peace, of the World Power Conference, said that the Conference had developed at a rate which he had never anticipated.

Section A: The Coal Industry (*continued*).

Continuing the discussion, Mr. H. L. Lewis (Victoria) gave some account of the use that was being made of brown coal in Victoria. The coal was very similar to German brown coals and was being used satisfactorily for the generation of electricity by the State Commission. With the latest boiler units which had been installed at the Yallourn power station a German type of mechanical step grate had been adopted with great success, together with pre-heated air, and he believed that pre-heating of the air in the burning of low-grade wet lignites or brown coals was very necessary. 650 lb. per sq. in. and 750 deg. F. had been adopted, with considerable reductions in the fuel costs.

Mr. William Erdos (Budapest) said it was necessary to construct a high-capacity stoker which would deal economically with both high- and low-grade coals. The "Record" stoker, a Hungarian production which had been in use for two years at the Budapest Royal Polytechnic University, achieved that object. The structure prevented the falling-through of dust and small coal, and at the same time ensured a favourable distribution of air.

Professor L. K. Ramzen (Moscow) said that the results achieved by the State Commission of Victoria in the combustion of Victorian brown coal corresponded in the main with the results obtained by Russian engineers. The application of a pulverised-fuel system to brown coal combustion could only give a negligible increase of boiler efficiency which, however, would be eliminated owing to the higher consumption of fuel and losses during the drying process.

Dr. Tomaides (Vienna) expressed the view that tests of particular coals in different countries should only be decided upon after an international standard had been agreed.

Professor M. Kamo (director, Fuel Research Institute, Korea) expressed a doubt as to whether anthracite could be burned successfully if it contained 5 or 6 per cent. of moisture, but said that in the Fuel Research Laboratory in Korea he had been successful in burning such anthracite coal by pulverising it.

Mr. H. Van Hettinga Tromp (Holland) said that the term bituminous coal covered a great many grades and qualities, and therefore some clearer and more definite classification was necessary.

Section B: Sampling and Testing of Solid Fuels.

This Section met under the chairmanship of Capt. Sinnatt (Fuel Research Board) in the afternoon of Tuesday, September 25th, when a general report on the papers was presented by Dr. A. Parker.

Dr. Parker, in opening the discussion, suggested that if the authoritative bodies representing the different nations were to get together, probably some satisfactory sample standard test could be universally accepted. He believed that a test for the determination of volatile matter could easily be decided upon as satisfactory for universal adoption. The method of determining the gross calorific value was fairly well standardised in the bomb-calorimeter method, but, with regard to the net value, different authorities made different deductions for each unit weight of water content. For steam raising plant it seemed, from the work done in Germany, that the net value was the more suitable, but that value could not be used for all purposes.

Mr. C. E. Le Maistre (secretary, B.E.S.A.) referred to the work that was being done by his Association with regard to the classification of coals and the national survey of the coal resources of this country; it was at the instigation of the Fuel Research Board that the B.E.S.A. got into touch with the coal owners and the scientific and commercial people, which resulted in a conference at which a report by the Fuel Research Board upon the coal resources of the country was adopted as a basis for further investigation and as a starting point for a much more detailed study of the whole problem. That conference brought out clearly that what was required in this country was some commercial agreement in order that a more scientific selling of coal might be brought about. Liaison committees had been formed in Cardiff, Newcastle, Glasgow, Sheffield and Manchester, so that the country was well organised, both on the principles and on the details.

Dr. E. W. Smith (technical secretary to the Conference) said that the World Power Conference itself had no intention of carrying out the standardisation work, and added that the Executive Committee felt it necessary to keep the door completely open to the encouragement of co-operation. He paid a high tribute to the work of the B.E.S.A., but said they must remember that all the wisdom did not lie in the B.E.S.A., nor in Great Britain.

Mr. G. W. Himus (Imperial College of Science) said that at the College they claimed to have got over the difficulty of oxidisation of coal during drying, by the use of a steam-heated vacuum oven, and from the technical point of view he preferred that to the xylol method, because, although the latter gave accurate results, the apparatus took up valuable bench space and was not useful for any other purpose, whereas the vacuum oven could be used for many other purposes. The method of determining volatile content adopted at the Imperial College was to heat the coal in a small silica tube which was enclosed in a larger silica tube, under such conditions that the gas evolved from the coal forced water out of a bottle into a second bottle, the water in which acted as a seal, so that the coal was heated and cooled in contact with its own gas, and avoided any risk of oxidisation. The consistency of the results obtained was in the neighbourhood of 0.1 to 0.2 per cent.

Prof. Vondracek (Czecho-Slovakia) hoped that they would soon come to an international standardisation of methods; his own country was rather rich in coals and lignites, and was ready to take part in this work. There was no doubt that the combustible sulphur had a most injurious effect whilst burning the coal in furnaces, but the conditions in which the coal was burned in a crucible in a laboratory and the actual combustion conditions in the furnaces were very different,

and the proportion of sulphur going into the gases would not be the same in each case.

Dr. H. B. Cronshaw described a method of truck sampling, "pipe method," which, he said, was very definite and fairly rapid; it had been used in the United States. A 3-in. pipe 4 ft. long was driven into a truck of coal at suitably chosen points and the pipe contents were heaped together in bulk in the usual manner.

Dr. F. D. Tideswell (Safety in Mines Laboratory, Sheffield) said he had never yet found any great value in the determination of the oxygen content. The main error was that belonging to the ash, and when a determination of oxygen had been made directly, it would still be essential to apply a correction for the mineral matter present.

Mr. A. Worsley said that any question of standardisation of form of analysis must secure the good wishes of the commercial world. Where dry coals and hydrous coals were lumped together it would pass the wit of any chemist to devise any method of analysis which would be acceptable both to the producers of dry and hydrous coal. At the present time the method used by the sellers of coal gave a very low value to lignites on account of their high moisture content, and difficulties arose in this connection for climatic reasons.

Herr Zur Nedden (Berlin) submitted the following resolution in regard to calorific value:—

"Whereas there is no uniformity in the practical application of the gross or net calorific value of fuel, solid, liquid, or gaseous, either within the several countries or as between producers and consumers of the fuel or internationally; and whereas such uniformity as convincingly pointed out in paper G3 and other papers is considered to be most desirable for correctly comparing efficiencies and fuel costs; be it resolved that the International Executive Council of the World Power Conference shall exert every effort to ensure international agreement on these matters."

Mr. C. E. Le Maistre (secretary, B.E.S.A.) seconded the resolution, and offered to submit an interim report upon the work done by B.E.S.A. in this respect as a basis of future work.

Dr. R. Lessing spoke in support of the resolution.

The resolution was put to the meeting and carried.

Section C: Coal Treatment.

On Wednesday morning, September 26th, Prof. R. V. Wheeler presided over Sections C and D, the general reports being presented by Dr. W. R. Chapman.

Dr. R. Lessing (vice-chairman), opening the discussion, said that during the last four years the cleaning of coal without the addition of water had made great progress, particularly in this country. It would be very useful to consider the claims made for the two methods of cleaning coal, *viz.*, wet washing and dry cleaning; the most important point in any such discussion was that of cost.

Mr. G. Lambourne (Cardiff) said the problem before the technicians was to evolve some system by which small coal could be cleaned, at a cost which could easily be borne by the producer, to a state of cleanliness which would give the user value for his money. Wet cleaning was efficient, but it was expensive; although Dr. Chapman, in his paper, referred to a cost of 3d. per ton, washeries where that was possible were very few and far between. On the other hand, the cost of dry cleaning could be brought below 3d. per ton; that figure related to actual practice in cleaning small coal, and it included both capital and operating costs. The advantage to the consumer was considerable; in one case, a consumer using about one million tons per annum found that by dry-cleaning the coal an increase in the calorific value of 7 per cent. was obtained, and in another case 9 per cent. Moreover, the ash content was 1 per cent. below the ash content of the shale in the coal.

Prof. Douglas Hay held that none of the dry-cleaning processes quite got to the desired point, whereas some of the wet-washing processes did.

Dr. R. Lessing referred to a process of coal cleaning which he said had not yet been made public, and was dissimilar from any of those discussed so far, in that it was entirely independent of the size of the coal. By this process it was possible to get the ash content down to between 1 and 3 per per cent. The process consisted of introducing the raw coal into a dense liquid, such as calcium-chloride solution. In order to comply with commercial requirements it was essential to remove the calcium-chloride solution from the coal without appreciable loss; this had been found possible by removing, in the first instance, the "fines" portion of the coal, which contained practically all the fusain, and was in character, both chemically and physically, entirely different from the pure coal. These fines had to be recovered in a condition in which they could be used directly, without further grinding, for powdered-fuel firing.

Mr. G. N. A. Pitt referred to a pneumatic dirt separating plant, of which the results had come quite up to expectations. This plant, treating 50 tons per hour, required the attention of a man and boy; there were no moving parts subjected to wear, and the coal was treated from 2 inches to 0 in one operation without previous sizing. In one case the ash had been brought down below 6 per cent., and the cost was exceedingly low.

Mr. A. Grounds said he wished to correct an impression that seemed to exist, that wet washing and dry cleaning were antagonistic to each other. That was not so at all. At more than one colliery there was a combination of wet washing and dry cleaning, which was very efficient, and dealt with the smallest coal. The two processes were complementary to each other.

Section D: Storing and Handling of Solid Fuels.

Dr. R. Lessing, who again opened the discussion as vice-chairman, remarked that the subject was entirely an engineering one. The breakage of coal in transport was a serious matter; the commercial side of the coal trade was based on the question of size of coal. It was a fact that coal lost as much as 10 per cent. of its useful sizes by disintegration between the colliery and the port, whilst another 10 per cent. might be knocked off in the few seconds during which a coal truck was discharged into the hold of a vessel. On the Continent during the last three or four years the transport of powdered brown coal or powdered semi-coke from brown coal had extended to a very remarkable degree, and the number of tank wagons specially designed for that purpose was rapidly increasing. In this country special wagons were being put into service for the conveyance of coal dust from the colliery to the consumer; these wagons had been specially designed so as not to allow the dust to consolidate to a mass which would not be capable of being handled by air currents at the other end, the wagons being discharged into the bunker by the simple application of compressed air.

Mr. H. W. Brooks (New York) reviewed the development of the use of pulverised fuel in America in power stations and elsewhere, and said that he believed the danger of fire and explosion in the handling and storage of powdered fuel had been eliminated by the process adopted so largely in America of pumping the coal, involving aerating it and causing it to flow as a liquid.

Section R: Peat.

"The Possibilities of Peat" formed the subject for consideration of Section R on the morning of Wednesday, September 26th, when Dr. C. H. Lander, director of Fuel Research, occupied the chair. Altogether six papers were submitted—three of these emanating from Russia—and in giving a *résumé* of them, Mr. T. C. Finlayson stated that they treated the question under the three main headings of resources, drying, and utilisation. The main problem in peat utilisation as fuel is that it contains about nine parts of water to one of dry substance, to overcome which drawback two methods of drying—natural and artificial—are resorted to. In Russia the most widely used process consists of passing the peat through macerators and conveying it in cars to drying fields, when it is spread in thin layers to be dried in the air. A simple two-operation process of drying was described in the paper by Messrs. N. Testrup and T. Gram (Great Britain) which utilises a quadruple-effect tubular drier, from which the peat issues in the form of a dry powder. The authors considered that their process of drying opened out a possibility of a distinctly novel and important nature. Thus, they pointed out that in producing electric power from solid fuel approximately 60 per cent. of the calorific value of the fuel was contained in the steam from the turbines which must be removed at a low temperature. The low-value heat could be used economically in the new process of drying peat. If the steam from the turbines was taken at 65 deg. C., the heat thereof would be sufficient to de-water all the peat required from 80 per cent. to 10 per cent. water content. A peat drier heated by waste steam in this way would practically take the place of the usual power station cooling-tower. By means of such an arrangement they considered the cost of fuel for power would be equal to the cost of gathering and transporting the peat plus capital charges and labour in connection with the drying plant, and they estimated the cost, exclusive of royalties, at from 2s. 6d. to 3s. per ton. Messrs. Testrup and Gram were so satisfied as to the practicability of the idea that in their paper they included calculations for the erection and operation costs of a power plant of a capacity of 30,000 kW.

It is in Russia that the principal developments in connection with the utilisation of peat have taken place, this being largely due to the work of Prof. Makarieff in developing hopper-feed chain grates and disk grates for efficiently raising steam by means of peat. It appears that the first tests were made at the Leningrad electric tramway power station in 1920, the successful results at which led to the erection in 1925 of a power station near the Shratura bog, about 72 miles from Moscow. The plant has a total ultimate capacity of 136,000 kW, of which only 48,000 kW, comprising three 16,000-kW turbo-generators, is at present installed. Boilers of the Garbe type, each having a heating surface of about 8,000 sq. ft., are used for steam raising, each boiler being equipped with a Green economiser of 6,888 sq. ft. and an air pre-heater of 7,750 sq. ft.

Three tests made at the Shatura plant of the evaporation rates per square metre of heating surface have given averages of 44.25, 52.4, and 46.9 kg. As a result of the satisfactory working of the station over a period of two years, the establishment of two additional turbo-generators of 44,000-kW each, together with the necessary boilers, has been decided upon. Moreover, peat firing has been adopted for the extension of the "Electro-transmission" sub-central power station; for one at Nijni Novgorod, where the initial installation of 20,000 kW is

already in operation; for the "Red October" power station in Leningrad of 20,000 kW, the capacity of which is being increased to 108,000 kW; for a number of small power stations at Lyapino, Sverdlovsk, Smolensk, Pskov, and other places, as well as in a number of Russian factories and works. Indeed, the Scientific Experimental Institute of Peat claims that the problem of economically burning peat with an efficiency as high as that obtained with the highest grade fuel has been satisfactorily solved in Russia.

In opening the discussion—the views expressed in which were not altogether optimistic—Dr. Lander, the chairman, pointed out that while peat had always been attractive to investors, it was a fuel of low calorific value. It had, moreover, the drawback of being largely only obtainable a long distance from industrial districts, which were centred round the coalfields. Mr. K. B. Eller expressed the view that apart from its use as fuel, it was worth while to utilise peat for its nitrogen content in the production of sulphate of ammonia. There was as much peat in the world as coal, and if the problem of reducing the moisture could be economically solved it was bound to play an important part in the fuel problem. Prof. Padovani dealt with the experiments which had been made in Italy where, however, the ash and sulphur contents of peat had proved a difficulty.

Mr. A. Worsley described his experience of peat winning and drying in the North of Scotland. Prof. P. Purcell mentioned that between six and seven million tons of peat was annually won and used in Ireland. Except for one machine, this was all taken from the bogs by hand and air dried. The problem of peat utilisation would not, in his opinion, be solved by complicated plants, which, in conjunction with transport, labour, and other costs, would raise the price to such a level that it could not compete with coal. He found it difficult to accept the costs put forward by Messrs. Testrup and Gram.

Dr. B. F. Haanel, of the Canadian Department of Mines, while congratulating the Russian delegates on their success, could not share their optimism, for during a period of twenty-five years he had had to make many reports on peat utilisation possibilities in Canada, his reports having had unfortunately to be mainly of a negative character. Peat winning and drying was only possible on from 100 to 110 days per year, and in his opinion the best calculations as to the cost per ton of producing a combustible fuel from peat were under-estimated by 50 per cent.

Mr. B. Mokershanky considered that as a result of the work of the Russian Scientific Experimental Institute of Peat, there would be big developments in peat utilisation within the next five years.

Section J: Utilisation of Fuels for Steam Generation and the Production of Electricity.

On Friday morning, September 28th, Sir Charles Parsons presided over this Section, for which Mr. G. Stoney was the general reporter.

Mr. R. P. Sloan (managing director, Newcastle-upon-Tyne Electric Supply Co., Ltd.), opening the discussion, said that some of the problems which had to be considered in the economic utilisation of fuel were still a long way from solution, and the expenditure of much time and money on research would be required before the solutions were reached. How long this would take would depend largely upon the extent of financial support the various research organisations received from those who ultimately benefited by their investigations. Much should and could be done to co-ordinate the research work which was at present being carried out by various associations and individually, and further to link up our researches with those of other countries.

The prevention of nuisance from products of combustion—smoke, dust and ashes—was one of the important problems yet to be solved by large consumers of solid fuel. The emission of smoke was a constant cause of complaint, due to the consequent pollution of the atmosphere and to the deposition of the substance on the surrounding country. The prevention or mitigation of these troubles was becoming a matter of first importance, more particularly due to the greater concentration of fuel-consuming plants. Many contrivances had been introduced to prevent the emission of grit from chimneys, but their use had not become sufficiently general to have had any appreciable effect, although some extension of their use might be brought about by the Public Health (Smoke Abatement) Act, 1926. There was also the nuisance caused by the consumption of fuel for domestic purposes in open grates. So long as this pollution of the atmosphere continued, the benefits to be derived from direct sunlight would continue to be denied to those living in thickly-populated areas. The electricity supply industry was sometimes accused of being extravagant, due to its use of raw coal, but much good work had been done on the low-temperature carbonisation of coal for the purpose of improving the economics of steam raising. The developments which had led up to the measure of success which had been achieved at Dunston were initiated by the Newcastle-upon-Tyne Electric Supply Co. and its associates, and extended over a period of 10 years or so. The problem which they primarily set out to investigate was the development of a low-temperature carbonisation process to operate in conjunction with an electric power station. During recent years Messrs. Babcock & Wilcox had taken an active interest in this development. If the cash value of raw coal was taken as 100, after its distillation two products were obtained: (*a*) Derivatives with a cash value of 87, (*b*) semi-coke with a cash value (on a thermal basis) of 76, or, together, a 63 per cent. increase in the cash value of the raw coal.

While he did not agree with many of the extravagant statements which had recently appeared in the Press, for which he was in no way responsible, he was sufficiently optimistic to believe that they were well on the way towards making a commercial success of the low-temperature distillation problem. Plants in number had been designed with excellent technical results, some of which had proved that the cost of their operation was not outside the range of practical commerce. In a country like Great Britain, where no natural oil existed, the economic solution of low-temperature distillation of coal was a matter of first importance, as, besides providing the means of producing large quantities of oil within its own boundaries, the value of its coal deposits would, in consequence, be enhanced, which might have a marked effect on the prosperity of the coal mining industry.

Turning to the subject of the proportion between capital and other charges and the cost of fuel, so that the cost of electricity might be a minimum, Mr. Sloan said that, as a supplier of large quantities of electricity for all kinds of purposes, it was not only his desire to see economies effected on the operating side of his cost sheet, but also to see that capital charges per unit of output were decreased at the same time. He was afraid that this was not happening to any great extent, and such economies as had been achieved were not due to any reduction in the cost of plant and apparatus, but were due to the improved load factor of the electricity supply undertakings. The question of the proportion of capital and other charges to the cost of fuel was illustrated in his paper,* and this showed that not very much could be done to cheapen supply to the small class of consumer of electricity by merely effecting economies on the thermal side, important as these might be—it was the capital side that required the greatest attention.

The use of mechanical stokers at sea was no doubt an advance on the old methods of hand firing; it should effect important economies in the operation of coal-burning ships, and might possibly check the development now taking place in the use of oil as a fuel for marine purposes. A further development was the use of powdered fuel on ship board. In both these cases it might be found possible to make use of inferior and cheaper grades of coal than were in general use at the present time.

Finally, Mr. Sloan referred to the last item on the agenda, the relation between the properties of steam at high temperatures and pressures. He said the steam turbine had approached so near its possible efficiency under the usual operating conditions as to pressure, and so much had already been done in the direction of improved vacuum, that it was to higher pressures they must turn for the attainment of greater efficiency. The results of recent research had now made possible the use of far higher temperatures than would have been practicable a few years ago, and already a considerable number of extra-high-pressure plants had been constructed; in certain cases pressures up to 1,300 lb. per sq. in. had been adopted.

Professor Douglas Hay said that with the improvement in load factor which might reasonably be expected in the future, the price of coal would be a larger proportion of the total cost than in the past. As a result of international over-production arising from a reduced world demand for coal, prices had to-day been forced below the cost of production. Roughly, prices were 10 per cent. above pre-war, wages were 30 per cent. and materials 60 per cent., involving a loss of 10 per cent. About 1,000 collieries, mostly uneconomic units, had disappeared out of 3,000. The remainder had almost completed plant reconstruction on the latest lines, and had overhauled their production methods and endeavoured to catch up with falling selling prices. As a result, even the best and most efficient collieries could not make a living, and prices were still steadily falling. Modern ideas in fuel technology and fuel economy had seriously injured the mining industry by curtailing its market, and the steady replacement of domestic coal by gas, electricity, and coke had replaced the sale of a fuel worth 25s. per ton by one costing barely half as much, and much less was required. Again, electricity works now expected to buy small coal, and in some cases unwashed low-grade slacks at approximately half the cost of production, so that the weight of the market was shifting from the large high-grade fuel to the small cheap fuel, with the result that the average selling price still depreciated. Free competition and the bargaining power of the large consumer had produced the natural result. Moreover, seams were getting more difficult to mine and of lower quality, requiring more preparation for the market. Then wages in mines could not remain at their present level, and would tend to rise, whilst curtailment of the hours of work would further increase the cost of production in an industry where 70 per cent. of costs was wages. All the factors were at work in every European country, and for these reasons he considered that world coal prices would tend to rise steadily in the future. He was certain that the Weir Committee's estimation of a cost of fuel of 16s. per ton in 1940 was fundamentally false. The coal owner had, in fact, been forced on the defensive, and was reacting by combining.

* An abstract of Mr. Sloan's paper appeared in the Electrical Review of October 5th.—Eds.

He thought that as the considerations outlined above prevailed in all European countries, they would eventually make an international coal agreement. It was to the interest of the nation to assist the collieries to attain an economic footing as quickly as possible and with as little rise in price as possible; the colliery market must therefore be widened by the finding of new outlets for various grades of fuel.

Referring to the use of surplus heat and low-grade fuels for electricity generation, he had given evidence on this subject before the National Fuel and Power Committee, and pointed out that at least 20 million tons of low-grade fuels was at present being mined, but not marketed by the collieries in this country, and abroad there was found the same phenomenon. This figure excluded some 16 millions already being used by the collieries for their own purposes. Few electrical engineers realised the extent of power generation at collieries. Approximately one million kW of generating plant was installed at collieries, mostly in the form of small scattered units. In one district for which figures had recently been collected, colliery generators produced more units per annum than the district power supply company. Power could be produced in this way for 0.25d. per unit at the point of use, no transmission charges being incurred. As against this a power supply company supplying the same colliery had to make a charge for transmission, and must charge anything from 0.5d. to 1.5d. per unit. In the case of a group of collieries, the difference between generating their own current and buying it outside might mean a cost difference of from £5,000 to £30,000 per annum, which explained why power companies did not make much headway in obtaining collieries as customers. There had been of late a tendency for large colliery groups to seek to supply outside consumers. With the grouping of collieries and the centralisation of by-product oven plants, there was a tendency to install medium-sized power stations in conjunction with the oven plants. It was soon found that the available supplies of surplus heat and low-grade fuels were sufficient to justify enlargement of the power station to supply an outside market, and that such supplies could be given at a competitive figure, thus bringing to the collieries valuable additional revenue.

Mr. W. M. Selvey, dealing with the distillation of coal, said he was not sure that Mr. Sloan's paper was not in many respects the most important paper that had been before the whole Conference. In Mr. Sloan's process he thought he had found something which amounted to what he himself had set down as the criterion, very much more nearly than anything he had previously met with. This was seen from an examination of the balance sheet. First of all, the ammonia had disappeared, and they were no longer dependent on the sulphate of ammonia for the balance sheet. Secondly, the low-temperature coke had disappeared, and they did not have to depend upon selling the coke at a very much higher appreciation than its thermal value. Thirdly, the gas had disappeared, and the electrical people would be profoundly thankful that they had not to tackle that problem. One of the most striking things about the process, also, was that it used Northumberland coal, which was a non-coking coal. Coking coals were comparatively small in amount, whereas the Northumberland coal was an ordinary good steam coal, so that the process would be capable of much more universal application than if it depended upon an extremely high-volatile coal, which had been the basis of nearly all the fuel balance sheets he had seen so far. Another feature of the process was that it worked up its own by-products. The products spread themselves over a fairly wide market, because the derivatives were more than one in number, and they were the kind of thing from which other derivatives were in every-day demand. Creosote was extremely valuable, for instance, and did not depend upon the oil industry, so that they were touching two or three markets. The only thing he was really bothered about was that the balance sheet showed a profit of so much per lb. of coal, and was not worked out on the basis of so many tons of coal multiplied by certain prices which meant a certain balance in the bank. Large financial combinations could look after themselves, but he wanted to feel reasonably certain that the profit did go to the electrical end of the business. In conclusion, Mr. Selvey said that the businesses which had stood up best to the conditions which we had been passing through, both in this country and in America, were the public utility businesses, both company and municipal, and in making no distinction between the two he expressed the opinion that municipal public utility undertakings would tend to some form of company management. If the people concerned with coal mining desired to see their prosperity come back, they must begin to think of the idea that from the moment a shaft was sunk until the ultimate product was delivered into the consumer's premises, that kind of constitution must be one, and more or less indivisible. He included in that other forms of public utility—gas, water, electricity, and so on; there must be one organisation to deal with a product that should never be used in its raw state, but should be so dealt with that it was developed into a large number of highly specialised products absolutely ready for use.

Mr. F. W. Napier said it seemed to him that the pulverised-fuel firing of boilers was only justified when large quantities of fuel were available which could not otherwise be used, and that very shortly even the burning of crude coal dust would be looked upon as an economic crime, because this dust could be robbed of some of its oil before burning. The paper contained information which had been a closely-guarded secret for many years, and the Conference was indebted to Mr. Sloan and his company for having made it available to the world at large. The process of low-temperature carbonisation described had been proved beyond question a commercial proposition. It must be a source of great satisfaction that this country was so far advanced and was able to produce the first reliable method of distilling coal on a commercial basis for power-station use. As one of the very few men personally associated with this work, although not directly associated with the Newcastle Co., he could say, from his knowledge of the past 12 months, that the plant had run during that time without a hitch. The plant was not more complicated to operate than an ordinary boiler. Indeed, he would say it was a little less because, owing to the many ingenious automatic controls that had been devised by the engineers and designers, the plant was nearly fool-proof. Recent trials had been carried out without any screening, and that was very important, because if the whole of the fuel was treated there was a very large saving as regarded the percentage of oils recovered. Some slight modification of the existing plant would be necessary to enable this to be done. The Newcastle Co. had explored all the markets, and knew exactly where they were, and he thought Mr. Sloan's figures were a little on the conservative side. The price of the semi-coke was taken at the same value as the initial cost of the fuel, the only right thing to do in the circumstances; but he suggested that by a slight modification of the plant it would be possible to obtain a fair proportion of coke suitable for domestic use, and then a still better return could be shown. When there was no market for it, that coke could be broken up and burned in the plant. In the cycle of operations described, the amount of clean steam required was very small indeed. Owing to the ingenious arrangement by which the hot coke was quenched, full use was made of the resultant steam, which was returned into the process, and consequently the amount of clean steam required was reduced to the absolute minimum, a matter of extreme importance to the boiler engineer. In conclusion, Mr. Napier said this question of low-temperature distillation was of vital importance not only to Great Britain, but to the British Empire, because in South Africa and Australia particularly it would enable us to hold a great deal of the money at present going to other countries.

Mr. A. Spyer (Messrs. Babcock & Wilcox, Ltd.) said that when his firm entered upon the Newcastle scheme, as described in the paper, they were asked if they could supply a plant for this large-scale, and somewhat costly, installation. Working in conjunction with the Newcastle Co., they found the subject of great interest; after perfecting the process and rectifying such weak points as occurred, it was apparent after some three years' working that it was a practicable affair. The installation was not a mere laboratory apparatus, but a plant dealing with 100 tons of coal per day. After three years' experience they arrived at the conclusion that the system was of sufficient importance for his company to take an active part in its development, and, in justice to his directors, he must say that the leading consideration in coming to this decision was the national importance of some such system, and not merely any question from a mere manufacturing point of view of a possible and small profit. If they could persuade producers, consulting engineers, users, and their advisers to standardise more or less on the pressures and temperatures they required for use in power stations, it would enormously cheapen the cost to them of the plant required for that purpose. One of the principal factors in the present-day high cost of plant was the constant and continuous changes and the fact that nearly every installation to-day was absolutely special in its character, and there was no such thing for the moment as standardisation. Mr. Sloan's observations upon pulverised fuel were of very great interest and importance. Personally, he rather feared that at present pulverised fuel was suffering from the well-meant but exaggerated claims of its friends, and there was danger of a reaction which would not at all be justified. At Dunston his company had installed a pulverised-fuel boiler, first of all to assure themselves that the duff which was resulting from the process could satisfactorily be burned under a boiler in a pulverised form when necessary; secondly, that the coke produced could also be pulverised and satisfactorily burned, and, incidentally, on their own account it was desired to make an experiment with regard to the process as regarded the evaporative duty of the tubes in the furnace of the pulverised-fuel boiler and to measure exactly what work those tubes were doing, the object being to throw some light on the various theories which had been put forward with regard to radiant-heat effect. The observations in Mr. Sloan's paper with regard to the economies obtainable were on the conservative side. Against the gain had to be set various other considerations, such as capital cost; nevertheless, it was fairly certain that the dollar efficiency from the point of view of the producer of the current would be increased. One speaker, representing the collieries, seemed to fear that the introduction of such a process would reduce the output of coal, but, personally, he was inclined to think the contrary would be the result, because there was no claim for an increased thermal efficiency in steam production. Therefore, the same quantity of fuel would be required for producing steam as before, and there would be used an additional quantity of fuel from the collieries which would be converted into extremely valuable by-products.

The National Radio Exhibition.—III.

Some Impressions of the Show, and brief Details of the Newer Apparatus on View.

THE British Broadcasting Corporation's exhibit was of an historical nature, including early apparatus, photographs, and a series of tableaux.

The number of receiving sets combined with a gramophone, or arranged for electrically-reproducing records, even in portable form, was little less striking than the variety of cone speakers displayed. There is much eagerness to cater for the demand for battery eliminators by most set makers, a number of whom point out that their devices conform to the Board of

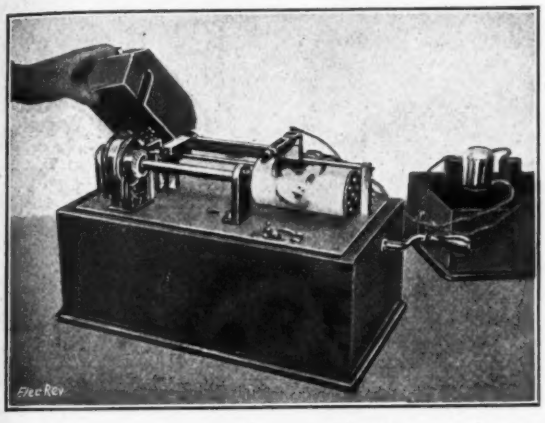


Fig. 1.—The "Fultograph."

Trade and the Institution of Electrical Engineers' regulations governing radio-electrical apparatus connected to domestic electricity mains.

Portable self-contained receivers of numerous makes were displayed, their performance having been much improved by the use of the newer types of valves. The latter have also been the cause of the cessation of use of heterodyne and crystal sets for ordinary purposes. Although wooden cabinets of handsome appearance predominate, metal containers for stationary sets made their appearance on several stands.

Wireless Pictures (1928), Ltd.

This winter enthusiasts will have an added interest in the tentative series of picture transmissions (facsimile photo-telegraphy) which the British Broadcasting Corporation is to carry out from its Daventry (5XX) station by means of the "Fultograph" system, which has been used on the European Continent, notably by the "Radio Paris" station. The receiver (a sample of which was to be seen on the stand of Burndept Wireless (1928), Ltd.) will be connected to any ordinary ratio set that is capable of operating a loud-speaker, and it will

Fig. 2.—The Screened "Ethophone."

work entirely automatically, consuming no more current than one ordinary valve; therefore, additional batteries will not be needed. The picture (about 3 by 4.5 in.) is built up gradually in three minutes, during which time the process can be watched on the cylinder of the instrument (fig. 1) which is revolved by spring clock works; when complete, the picture does not require fixing or developing, as a specially prepared paper is used.

Burndept Wireless (1928), Ltd.

The company's range of instruments and accessories included six attractive receivers. The capabilities of the frame-aerial 7-valve "super-het." are known as well as those of the O-V-2 short-wave (12 to 100 metres) set. The 1-V-2 "Empire" screened set is intended for overseas use, having two ranges of 20-48 and 220-560 metres; reaction remains constant throughout and always under control. Another screened set (1-V-2) has two ranges of 220-560 and 750-2,000 metres, but no coils to change, whilst the screened "Ethophone" (1-V-1) has a transformer-coupled last stage with a "Pentode" valve, and two ranges of 210-550 and 650-2,100 metres without changing coils; this new set (fig. 2) has a pegamoid finish and somewhat unorthodox appearance. The screened 1-V-2 portable receiver (fig. 3) has medium and long-wave ranges, but no coils to

Fig. 3.—Burndept Portable Set.

change; it is self-contained, weighs 29 lb., and the enclosed speaker is of the cone variety. When closed the set measures 15 by 15 by 8.25 inches.

Graham Amplion, Ltd.

The 21 models of horn and cone speakers made by this company include the new "Lion" in a variety of sizes and styles; it is also obtainable in "chassis" form (fig. 4) by manufacturers or others desirous of fitting it into an existing piece of furniture. This attractive speaker is of the reed-cone type and does not require exciting like a moving-coil device; it certainly is a good sound reproducer, can handle large volume,

Fig. 4.—Amplion "Lion" Speaker.

and is adjustable to suit large and small receivers. Another new product of the company is a "Lion" speaker, gramophone, mains-operated amplifier, and receiving set combined in cabinet form.

Igranic Electric Co., Ltd.

As has already been announced, this company's radio activities are to be intensified this season. Its large exhibit included "Igranikit," the assembly of which is simplicity itself: all wiring is mounted ready on an insulating sub-base, so that the constructor only has to secure the component parts to the base-board, slip the wired sub-base into position, and screw the lot tight. The circuit comprises a single stable high-frequency amplifying stage, a detector valve, and a low-frequency amplifying stage, designed for operation with batteries housed in a cabinet forming a pedestal base for the receiver. When a "Pentode" valve is used in the last stage the employment of a mains unit is preferable. The two main controls of the "drum" type are used for adjustment of aerial and high-frequency tuning, and subsidiary controls for sensitivity and volume are also provided. The normal wavelengths

Fig. 5.—"Igranikit."

used for European broadcasting are covered by two ranges of "plug-in" units, each range comprising two units, one for the aerial circuit and one for the h.f. circuit. The outfit of parts contains everything necessary to build the receiver, fig. 5, including the all-metal case, which may be built up from separate sections with ease.

Marconiphone Co., Ltd.

Several of this company's new season's products have already been described in our pages. The receivers are arranged for mains or battery operation and incorporate screen-grid and "Pentode" valves. This large display included new moving-coil cone speaker cabinets and units in various models and styles which embody a system of suspension that is claimed to greatly reduce resonance and give equal value to all frequencies in the musical scale. The cabinets are available in oak or mahogany, with field windings for 6-volt battery, d.c. mains, or a.c. mains, the latter model including a rectifying valve. Three moving-coil movements are also listed with field windings as above; a rectifier may be built for a.c. from special components. Power amplifiers (mains operated only, 200-250 V, d.c. or a.c.) incorporate an input transformer, two power valves, and the necessary circuit for high and low voltage and grid bias, being thus entirely self-contained. They may be added to existing receivers employing one or two l.f. stages, and will then drive a moving-coil speaker at full volume for dancing, &c. A new trickle charger for a.c. mains was also shown, employing a Westinghouse copper-oxide rectifier and suitable for 2-, 4- or 6-volt accumulators.

Gambrell Radio, Ltd.

These a.c. and d.c. mains receivers are totally enclosed in black crystalline finished cabinets, and coils do not have to be changed. The "Table-Model Four" is a screen-grid set simple to handle by thumb-control on a dual drum, which is the only main control. This model is also arranged for connection to an electrical gramophone pick-up and volume control which operates both when used as a gramophone reproducer or a wireless set is a good feature. Not the least attractive feature is the fact that all "Gam-brell" mains receivers are fitted with fuses which protect both the set and the house-lighting fuses, so that in the event of a mishap of any kind neither the lighting system of the house nor the instrument will be affected. The "Combinator" for a.c. mains is an anode and grid-bias battery eliminator and trickle charging unit. It has two sets of h.t. tappings, one for the output valve and one for other valves, distortion due to back-coupling being thus reduced. Each set of tappings numbers 5, while there are eight tappings for grid bias giving up to 25 volts; 2-, 4-, or 6-volt accumulators may be charged, the rate being ½ amp. New components include the "Voluvernia" for volume control, which is supplied with insulating bushes for mounting on metal panels.

Falk, Stadelmann & Co., Ltd.

New models of battery eliminators were on view, and also receivers; the latter incorporate screen-grid and "Pentode" valves, wavelength change-over switch and astatic coils. Reaction is on the anode coil and the 4-valve set has an additional r.c. coupled l.f. stage for operating a moving-coil speaker.

Chloride Electrical Storage Co., Ltd.

In addition to accumulators, an "Exide" trickle charger is now available for a.c. mains. It incorporates a Westinghouse copper-oxide rectifier, meters, and switching facilities on a much more ambitious scale than usual, enabling the charging operation to be suitably controlled for all conditions

Large Electric Tramcars.

Some Particulars of the Rolling Stock of the Electrified Swansea and Mumbles Railway.

THE eleven new cars provided for the Swansea and Mumbles Railway, which has recently been electrified, are claimed to be the largest electrically-driven tramcars that have been built for service in this country. They are each capable of seating a total of 106 passengers, 48 in the lower saloon and 58 on the top deck. The cars are of the double-bogie, double-deck, covered-top type, with a platform and staircase at each end, but many modifications have been introduced in their design in order to meet the needs of the service for which they are intended. As will be seen from the accompanying illustration, fig. 1, they present a very imposing appearance. The large passenger-carrying capacity is made possible by the provision of double cross seats on either side of the gangway, and the specially designed underframe, patented by the Brush Electrical Engineering Co., Ltd., the makers of the cars, permits the use of a full-size gangway. The unusual size of the cars necessitated, of course, very careful design of the structure, particularly because of the severe strains imposed upon the framework by the application of the air brakes.

For the main body framing teak is used, the waist panels being of mahogany. The top cover framing is chiefly of teak, the pillars and corresponding roof sticks being strengthened by continuous steel tee members. The interior finish on both decks is handsomely carried out in mahogany. At each end a separate cab is provided for the accommodation of the driver, and between this cab and the main entrance door is a space available for housing passengers' luggage. A departure from the usual practice is represented by the platform entrances being both on the same side of the car. The entrances are provided with four-fold hinged doors, which are opened and closed by mechanical means by a lever in the driver's compartment. The external fittings of the cars include

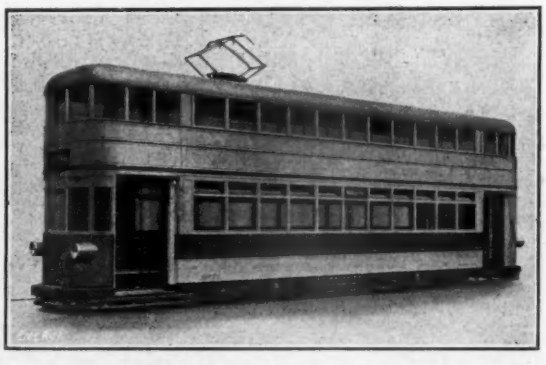


Fig. 1.—A Mumbles Tramcar.

two powerful electric headlights fitted into the front of the platform vestibule at each end. These are of the "Gilderay" type, having special parabolic amber-tinted reflectors. A

focusing arrangement is fitted and a special dimming switch is provided. Spring bumpers are fitted to each platform, and also spring radial draw and buffing gear, so that two cars may, if necessary, be coupled together and operated as one unit.

Each car is mounted on a pair of equal-wheel bogie trucks, specially designed so that the floor height is kept as low as possible, *i.e.*, 2 ft. 4 in. from the rail level. The wheels are 26 in. in diameter, with tires 5 in. wide to suit main-line rails. All the motive power equipment was supplied by the British Thomson-Houston Co., Ltd., which also supplied the air-brake gear with which the cars are fitted. Current is collected by means of a pantograph fitted to the roof of the top cover, which can be pulled down by means of a winch fitted at the head of the staircase, a trap door being provided at one end to give access to this collector.

Each coach is fitted with two-motor driving equipments. The traction motors are each of 60 h.p. at 600 volts, and are of the box-frame, interpole, fully-ventilated, roller-bearing type.

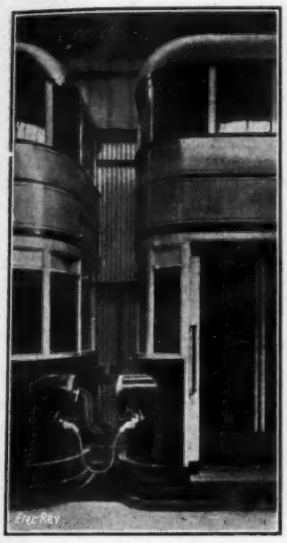


Fig. 2.—Coupling Arrangements.

Fig. 3.—Driver's Compartment.

The control is of the electromagnetic contactor type, only small control currents being dealt with by the master controller; the heavy motor currents are broken on individual contactors.

On account of the somewhat unusual physical features of the route, which has the sea on one side and the highway on the other throughout its length, the control has been so arranged that the master controller is located on the same side of the coach at each end. The air-brake system is of the straight type with emergency provisions, and arrangements are provided for coupling the air system between the coaches. "Dead-man" features are provided in the handles of the master controllers to ensure that the power is cut off and brakes applied in the event of the driver becoming incapacitated, and overloads are taken care of by a relay which opens the line contactors, which can only be reclosed when the master controller is returned to the "off" position.

The control is arranged for bridge transition, and as there is no bus-bar line running through the train, each coach picks up its motor current through its own pantograph collector, but the control current for the train is taken from the leading pantograph only. Fig. 2 shows the coupling arrangements between two of the coaches, and fig. 3 depicts the driver's compartment.

The Post Office Foreign Contracts.

Statements by Mr. Thomas Bolton and Mr. L. S. Amery.

In our last issue we reproduced Mr. L. B. Atkinson's reply to the Post Office attack upon the Cable Makers' Association. We now publish a copy of a letter that was sent to the Postmaster-General on October 3rd by Mr. Thomas Bolton, the chairman of the Non-Ferrous Metals Group of the Federation of British Industries. The writer says:—

"As chairman of the Non-Ferrous Metals Group of the Federation, I have been asked by those of our members interested in the manufacture of telephone bronze wire to address you regarding the placing of contracts for this material with French and German factories.

"The intimation that their tenders had been declined and that orders were to be placed abroad—causing, of course, additional unemployment—was received by British manufacturers of bronze wire simultaneously with an appeal from the Prime Minister to attempt to absorb labour from the distressed areas.

"Our members recognise that it is somewhat outside their province, as manufacturers, to criticise the policy of the Government of placing work abroad when there is so much unemployment at home, but estimates have been put before me, from which it would appear that any saving to the Department in the price of wire will at least be offset by the extra amount to be found by the country in unemployment pay.

"What gravely concerns the manufacturers, however, is the effect caused by the example set by the Post Office, and by the incorrect and misleading statements issued in explanation of their action, as published in *The Times* of August 25th and September 25th, which, unless contradicted or withdrawn, will seriously damage British industry, causing still further unemployment. In fact, the damage already done cannot entirely be repaired, as is abundantly evident from the correspondence which the manufacturers are receiving from municipal corporations and other buyers, at home and abroad.

"These statements amount to a charge that British manufacturers of this material have united to obtain excessive prices from the Department, and have refused to accept contracts when offered to them at 'reasonable' prices.

"The manufacturers claim that their prices are unreasonably low, rather than high, and that it is unfair to compare them with those of products of manufacturers in the countries where the costs of labour and taxation are considerably lower than in Great Britain.

"In the Post Office statement given to the Press, a reference is made to the recommendation of the Select Committee on Estimates, to the effect that the Post Office should have a free hand to accept tenders from abroad in cases where it is unable to obtain satisfactory evidence that the prices quoted by British manufacturers are not excessive. In the present case, the officers of your Department have been afforded full information, and the tenderers understood that they were satisfied that, under the circumstances of costs obtaining in this country on the limited requirements of the Post Office, the prices are not excessive, and carry little or no profit to the manufacturers.

"In confirmation of this, I may state that I have seen a certificate furnished by a firm of chartered accountants to the effect that the price tendered would provide a gross profit of less than 3½ per cent., which would be more than absorbed by standing charges.

"The Post Office have, in the past, treated as evidence that British prices are excessive the fact that, at one time, lower prices were quoted abroad. This was done in order that, with this department of the works full, more labour would be employed and the cost in the home market reduced. The Post Office were well aware of the circumstances, and received the benefit of the reduction in cost; they are also aware that, for some time past, it has not been in operation.

"I trust, therefore, you will be willing to make further inquiries into this matter; the manufacturers, on their side, are confident that the results of your investigations will satisfy you that steps should be taken to remedy, as far as possible, the injustice which has been done to them.

"In view of the publicity which has already been given to the matter, I am sending a copy of this letter to the Press."

On Saturday last the following reply to Mr. Atkinson from Mr. L. S. Amery, M.P., was published in *The Times*:—

"I regret if the report of my speech at Yarmouth on the question of the recent Post Office contract for bronze wire—whether through inadvertence on my part or due to compression on the part of the reporter—should have conveyed the impression that his (Mr. Atkinson's) association controlled the production of bronze wire in this country. I was, of course, aware of the fact that in this case the Post Office were dealing with a different set of firms from those which were referred to in the Report of the Select Committee on Estimates last July, and I only instanced the latter in order to show what had been the attitude of the Select Committee towards a similar problem. In any event I fail to see how, even if I had confused the two cases, this would have 'exploded the whole of the excuse' for the action of the Post Office.

"To support this conclusion Mr. Atkinson would have to show that bronze wire is outside the control not only of his association of manufacturers, but of any other; and I fear he would find this difficult, seeing that, as has already been publicly stated by the Postmaster-General, the firms producing bronze wire in this country have for years quoted uniform prices to the Post Office, which on the recent occasion were substantially above those quoted by foreign firms.

"Mr. Atkinson also protests that it is not a fact, as I stated, that the Committee came to the conclusion in the case of the Cable Association that they were asking excessive prices, and quotes one paragraph of their Report to show that they only said that the cables could be obtained from foreign manufacturers at considerably lower prices than those paid to the association. He omits, however, to quote the further paragraph which stated that the association quoted higher prices to the Post Office than to Colonial Governments and to the Irish Free State, or the actual conclusion of the Select Committee, which runs as follows:—

'Your Committee, while fully appreciating the importance of encouraging home industries, are not satisfied with the position as disclosed by the above evidence, and are of opinion that the Post Office should have a free hand to accept tenders from abroad in cases where it is unable to obtain satisfactory evidence that the prices quoted by British manufacturers are not excessive.'

"I confess I do not see that my brief summary differs substantially from what the Committee intended to convey. The whole point of my speech was, indeed, the same as that made by the Committee—namely, that while I strongly advocated preference for British goods, not only by Government Departments, which are already under standing orders to give it, but also by local authorities and by private citizens, I agreed that the extent of such preference could not be unlimited, and that where a department came to the conclusion that an excessive price was being asked it should be entitled to admit the corrective of outside competition."

Continental Fairs.

Electrical Features of the Exhibits at Leipzig, Vienna and Utrecht.

By Our Special Representatives.

Leipzig Fair.

As usual with the autumn fairs, the electrical department at Leipzig was in the main devoted to proprietory articles calculated to catch the eye of the buyer, and the purely technical side was absent; nevertheless, there were some interesting novelties to be seen.

The most important exhibit as far as this country is concerned was the "Fultograph," a new type of apparatus (invented by an Englishman, Capt. A. Fulton) which receives pictures by means of radio-transmission from wireless stations and can be fitted to any good radio receiving set. The "Fultograph" is a great improvement on the instrument which is now being used for receiving radio photos from the Copenhagen station, and is simple in construction; the picture is formed on a moving roll, and the result is exceptionally clear. The "Fultograph" is handled by Messrs. Robert Kurst, of Berlin, who are not yet prepared to dispose of the complete machine, though they did an enormous business in component parts. Great Britain was especially prominent amongst the buyers. The complete machine is somewhat expensive, but the price is sure to be reduced as the manufacturers perfect their production plans to cope with the great demand. The "Fultograph" is certainly a step forward in radio photography.

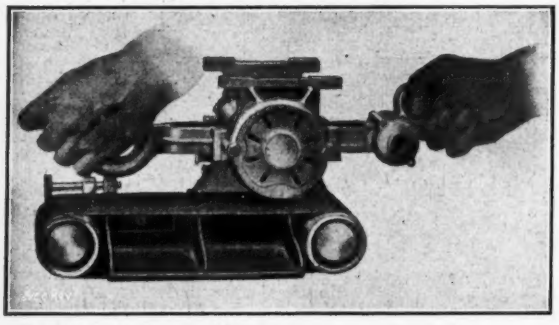


Fig. 1.—Sandpapering Machine.

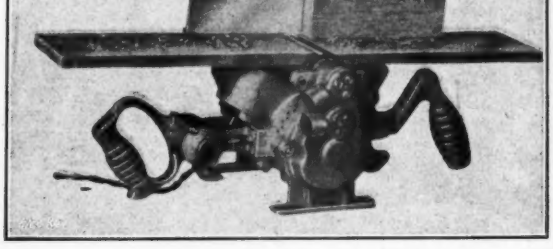


Fig. 2.—Planing Machine.

The "Thermator," an innovation in water heaters, takes the form of a circular disk fixed behind an ordinary tap; the disk is fitted with a socket from which a flex is connected to the mains, the loading of the plate being sufficient to heat water to 80 deg. C. The makers have a full range of Thermators with loadings ranging from 1,500 to 9,000 watts.

A number of new electrically driven hand tools for the carpentry trade were exhibited by Messrs. Paul Schachal, of Berlin; amongst them were boring tools for both wood and metal, drills, planes, hand-saws, and an ingenious device for sand-papering surfaces (figs. 1 and 2). All these machines are light and simple to work.

An electrical glass-drilling machine capable of boring holes of various sizes in sheet glass found a ready market amongst large automobile concerns, which use it in connection with wind screens (fig. 3). It seems that the urge to produce a better "daylight" lamp has taken firm hold of Continental electric lamp manufacturers, and the number exhibiting these products was amazing. There certainly is a large market for the perfect article.

A Berlin firm showed electrically heated bandages and poultices, which may revolutionise practice in the hospital. Electrically heated carpets, specially designed for motor travellers, were also shown, as well as foot-warmers and bed-warmers.

An electric wash-drying machine was exhibited by a German firm; it is called the "Sonne," and is small enough to install in private houses, where its performance should make it a welcome addition to the laundry equipment. Washed materials of all kinds can be thoroughly dried in four or five minutes.

Doctors and surgeons were interested in the "Rondolla Medica," which consists of a powerful lamp fitted over a table on which instruments and equipment can be kept. The lamp, which can be manipulated to suit all angles and all degrees of light, is fitted with a reflector for eye, nose, and throat specialists, and coloured glass can be fitted over it when necessary. The instrument table can be made to move round by pressing a button, so that the surgeon can reach his instruments without trouble or changing his position.

A novel form of electric advertisement was a cash desk fitted with glass sides on which advertisements were painted; this automatically lights up directly money is placed on the metal cash slab.

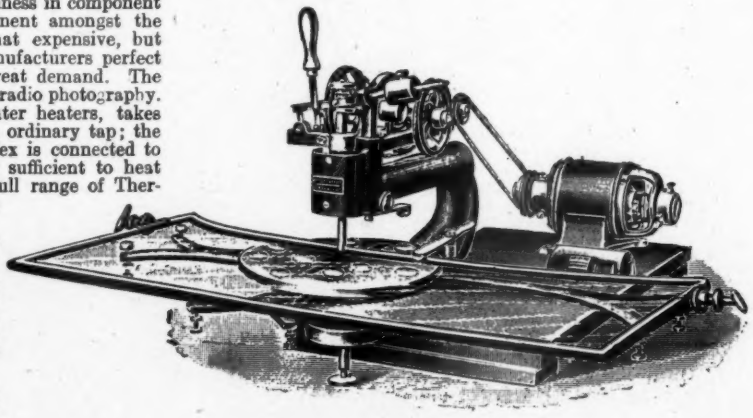


Fig. 3.—Glass-boring Machine.

The "Forfex" electric hair-cutting machine is an improved type, complete in itself, and does not require any more room to manipulate than ordinary hair-cutting scissors; the total weight of the instrument, including cable and plug, is only 1¼ lb., and the actual weight in the barber's hand is less than 1 lb. The small but powerful motor which is fitted in the handle of the "Forfex" is noiseless and perfectly safe in use.

Vienna Fair.

The general standard of the electrical section at the Vienna Fair, which recently terminated, was of a very high order, not only did Austrian electrical manufacturers exhibit, but well-known firms from Germany, Sweden, Great Britain, United States, Switzerland and Holland also competed for orders from the large number of buyers who came straight to Vienna from Leipzig, as well as many from the Balkans and the Near East who regard Vienna as a natural market wherein to purchase their requirements.

Two British firms had stands this year—The Standard Electrical Engineering Co., and the Marconiphone Co., Ltd.—who both made an excellent showing and, it is reported, did very good business. The largest display, as was only natural, was by the Austrian firm of Siemens Schuckert, who exhibited electrical equipment ranging from kitchen labour-saving devices to large farming machinery.

One of the most interesting exhibits by this firm was an electrical hoe which weighs 800 lb. and has a radius of 90 centimetres. The teeth are self-sharpening, and the machine is drawn by a single-cylinder 8-h.p. engine. A smaller machine of the same type for gardens and small farms was shown fitted with a 5-h.p. engine.

The Siemens-Schuckert firm exhibited a complete independent house-lighting set which is supplied in ranges from 32 to 65 volts, and another from 110 to 220 volts. An electrical appliance which will fulfil the functions of a number of labour-saving devices for the kitchen was shown; it consists of an electromotor to which are fitted certain parts for performing different services. It can be used for grinding coffee, mincing meat, cleaning knives, cutting bread, sharpening knives, and many other necessary culinary services. The machine is adapted for both direct and alternating current, at any voltage; it attracted much attention and was sold in large numbers.

Two new health devices are worthy of special mention: The "Savage" electric health motor is a small motor driving a wide endless leather band, which, when placed round the waist or other parts of the body, produces a massage-like movement. The second is a very small and compact high-frequency violet-ray apparatus shown by the firm of Sikor. This machine is called the "Kos."

Hotels will very soon equip themselves with the latest idea for rousing their guests at a stipulated hour in the morning. A small dial numbered like a clock-face will be placed in each room, and the guest will simply set the dial to the time he wishes to be awakened in the morning; at the appointed hour a bell will ring—quite independent of the porter or valet—which will not stop until the guest himself disconnects it.

A strange feature of the fair was the enormous quantity of police flashlamps bought by British buyers. Hardly any other country—not even Austria herself—bought much in this line.

A German firm, Messrs. Wengraf & Platzner, exhibited a cheap electrical air-purifying apparatus which works silently and emits such a fine spray that it will cause no annoyance to ticket-holders in kinemas or theatres, where its usefulness will be appreciated.

An interesting type of floor-polishing machine called the "Monopol-Bohner" consists of a dust pan, at each end of which is a large polisher which rotates inversely and creates a suction to take up the dust. This machine can be run on any power supply and is used for cleaning, waxing, and polishing floors.

The New York Savage Co., which has already been mentioned, showed a new type of laundry drying machine which is both compact and easy to manipulate; it is so small that it can quite easily go into a one-family house, and it does its work very well.

Utrecht Fair.

The biennial Utrecht Fair is regarded as of extreme importance by buyers from North-Western Europe, including Scandinavia, Finland, and the Baltic States. This season's electrical exhibition was of unusual interest because of the fact that electrical machinery manufactured in the Netherlands was shown at Utrecht on a much larger scale than at previous fairs.

Several British firms also took part, and it is expected that when the results of the excellent business obtained at Utrecht are generally known, more British firms will become keen to display their goods in this important market. The well-known British firm, Attwater & Sons, Ltd., exhibited a new electrically-controlled hydraulic packing machine and certain of its standard electrical equipment. The London Electric Wire Co. & Smiths, Ltd., had an attractive display of its various types of wire and electrical accessories, amongst which were cotton-covered wires, high-resistance wires, telephone switchboards and aerial cables, rubber insulators, and a large assortment of flexes. Another firm—the Ingersoll Rand Co., Ltd.—had on exhibition some new types of electrically operated pumps and pneumatic instruments. British goods are much appreciated in Holland, where low price does not rule to nearly the same degree as in other European countries, Holland being always ready to appreciate superior quality and to pay for it.

The large Dutch electrical engineering house, N.V. Machinfabriek Jaffa v/h Smulders of Utrecht, showed a number of centrifugal and screw pumps specially constructed for drainage mills. One of the firm's specialities is an electro-mechanical installation for bridges, lock-gates, sluices, and sewer valves, of which more than 150 are now in use in the Netherlands alone. The company has just completed and installed a lock-gate in connection with a dam at Ymuiden, which is said to be larger than the largest lock-gate on the Panama Canal. The same firm has built what is claimed to be the most powerful water draining plant in the world.

The Heemaf Works, another Dutch firm, displayed a new model of the SKA 2 motor, which is specially constructed to withstand very heavy starting loads. During a demonstration arranged by this firm a weight of approximately five tons was easily lifted at a speed of 80 feet per second. The Heemaf Works had already shown this motor at the Leipzig Fair held during the spring of this year, and was very gratified with the business which resulted. It expects that the slip-ring type of motor will be gradually superseded by motors constructed on the SKA principle because the SKA motor lends itself to greater reliability and simplicity, whilst the price is actually lower than that of the older type. The Dutch State Coal Mines have already installed a number of SKA motors aggregating 300,000 h.p., and have given a recent contract to the Heemaf Works for a number of additional machines, making a total of 10,000 h.p., for their new synthetic ammonia works.

The Dutch Government, now that the "ring" has been broken up, is aiding the native electrical engineering industry to the full extent of its power, and the Dutch East Indian Railways are using only electrical equipment manufactured in the Netherlands, thus providing work for Dutch labour and giving manufacturers a good deal of business to occupy them for some time to come.

A new electrically controlled pumping apparatus had been brought out by the Machinfabriek Gebr. Stork & Co. of Hengels, in Holland. This is called the new Stork "Baby" pump; it is automatic, and can be used for air or liquids or for a mixture of both. Another automatic pump, constructed on the centrifugal principle and having no foot valve, was also shown.

The large Dutch firm, Messrs. Philips, had one of the most interesting displays at the Fair; their products were of the standard types already well known. The German firm, Damag, exhibited a new reflector, which sold readily.

As was to be expected, the electrical household and general utility equipment was very well represented by such appliances as refrigerators, vacuum cleaners, and electric irons.

Electrical Power Engineers' Association.

Annual Dinner.

THE tenth annual dinner of the Southern Division of the Electrical Power Engineers' Association was held at the Hotel Cecil, London, on October 6th. Mr. W. Cornet, chairman of the Division, presided, and there were nearly 500 members and guests present.

After the loyal toast, "The Association" was proposed by Lt.-Col. Kenelm Edgcumbe, president of the Institution of Electrical Engineers. He said he had the highest respect for all connected with the supply industry, but he did not think that the industry had quite taken the sales side of its work to heart. While he could not imagine a gas man cooking by means of electricity, he knew a good many electrical engineers who used gas. The ladies could do a great deal in this connection. Referring to the national schemes, Col. Edgcumbe said there were bound to be displacements among members of the staffs, but if electricity were pushed sufficiently, he believed all the displacements could be absorbed. The E.P.E.A. was out for efficiency of the industry, status of the personnel, and progress all round, and he congratulated the members on such excellent ideals. He thought the discussions of the Technical Groups should work quite well in parallel with those of the I.E.E.

Mr. A. C. Stewart, B.Sc., president of the Association, in reply, said that the presence of Col. Edgcumbe was a sign of the good relationship between the I.E.E. and the E.P.E.A. He recalled the fact that the Institution extended its recognition to the Association on the advice of the late Mr. C. H. Wordingham (past president I.E.E.). It was the policy of the Association to increase the technical knowledge of its members, particularly the junior ones. Until a few years ago a certain amount of latitude was allowed to the junior members, but now it was "get on or get out." The training scheme of the Association had now been put before the National Joint Board. The Technical Groups were not in any way competitive with the I.E.E. They would give the manufacturers and users

a chance to get at one another. In referring to the work done by the Central Electricity Board, Mr. Stewart agreed that there must be displacements, but they wished them to be as light as possible. A committee had been set up by the National Joint Board to organise the work of replacing the members, and that committee would be of great value to the industry. The Association to-day was in a better position as regarded membership and finance than it had ever been before. He appealed to all supply authorities to help British industry when buying goods.

Mr. W. Cornet, chairman, proposed a hearty vote of welcome to all the visitors present.

Alderman W. Walker, chairman of the National Joint Board, replied, and paid a tribute to the members of the executive of the Association, not only for the work done, but also for the spirit which they fostered. He thought that there ought not to be necessity for a single displacement. The industry was passing through a particularly interesting time; the Central Board had not been standing idle, and it was hoped that the 4th area scheme would be published during the next week. He had recently seen the first half-dozen of the "grid" towers erected, and he was surprised at the way they "melted" into the surrounding country. All had been astonished at the work done by the women, and the industry owed a great deal to the E.A.W.

An interesting feature of the proceedings was the presentation to Mr. A. W. Crompton of a black lacquered bureau and a similar chair, and also an illuminated bound volume containing the signatures of officials of the Association and members of the National Joint Board, as an appreciation of his services to the Association as president during the past year. Mrs. Crompton was presented with a ring.

In his reply, Mr. Crompton thanked his employers, the Newcastle-upon-Tyne Electric Supply Co., Ltd., for facilities granted to him during his year of office for carrying out the work.

Legal.

British Thomson-Houston Co., Ltd., v. Okers.

In the Vacation Court on October 3rd, Mr. Tookey, on behalf of the British Thomson-Houston Co., Ltd., moved *ex parte* before Mr. Justice Maugham to restrain an alleged infringement of the plaintiffs' patent for gasfilled lamps by R. Okers, Beaumont Square, Mile End Road, E., and to restrain the defendant from parting with the alleged infringing goods pending trial or further order.

Mr. Tookey stated that in recent proceedings against a firm in the Commercial Road it was found that the infringing lamps were purchased from Okers. For some time past there had been a considerable trade in foreign-made lamps which were an infringement of plaintiffs' patents. That trade was carried on chiefly by small people, and if the plaintiffs issued a writ without first getting an *ex parte* order the lamps were disposed of to other people who dealt in them in the same way.

His Lordship granted an injunction over the second motion day of next Sittings, restraining the defendant from infringing plaintiffs' patent and from disposing of any infringing lamps in his possession meanwhile.

Alleged Fraudulent Consumption of Electricity.

Ruth Field, trading under the name of the Stonehouse Radio Supplies at Stonehouse, Plymouth, was charged before the Plymouth magistrates on October 5th with fraudulently consuming electricity supplied by the Corporation to her premises, and with causing electricity to be diverted. Defendant pleaded "Not guilty."

On behalf of the Corporation, the Deputy Town Clerk, Mr. E. Vosper, stated that, as far as was known, this was the first case of its kind in Plymouth, and the object of the proceedings was to bring that particular section of the Larceny Act, 1916, to the knowledge of the defendant and others, as the Corporation had reason to believe that a considerable number of electricity consumers in the town were similarly offending. In this case it was noticed by officials that large lights were burning in defendant's shop all day and in the evening, and on inspection it was found that the lights were not connected in the lighting circuit, but in the power circuit.

Being of the opinion that there had been no intention to defraud, the magistrates dismissed the case.

The World Power Conference.

It is announced from Berlin that the German National Committee which will be responsible for the organisation of the World Power Conference in that city from June 16th to 26th, 1930, has obtained the consent of Dr. Ing. Oscar V. Miller to act as the honorary president.

Correspondence.

***Correspondents should forward their communications as early as possible.** No letter can be published unless we have the writer's name and address in our possession.*

Earth or Insulate?

In reply to Mr. S. F. Philpot and Messrs. Hogan and Wardrop, I am prepared to admit that the great proportion of small electromotors are sound as to insulation resistance when they leave the factory.

We contractors usually meet these small motors after they have been in use for a short time, sometimes very short, and after a few applications of the domestic oilcan; and I can assure these gentlemen that very few of these appliances will bear a lamp test between windings and frame. As a matter of interest I have to-day gone through our stock of small motor-driven appliances, all new, consisting of three vacuum cleaners, eight fans, two hair-dryers, and two vibrators, all by reputable makers, and have made a few tests. The results are rather interesting. Testing at 500 volts, two appliances only show an insulation resistance of 1 megohm, four others barely touch 0.5 megohm, four others are under 0.1 megohm, and one under 5,000 ohms. Of the remainder, two will pass sufficient between windings and frame to light a neon lamp, and two will light 60-watt lamps. It will be remembered that these are all new appliances, whilst all those that we have in for repair at the moment show zero insulation resistance between windings and frame. The actual windings may be electrically sound in some cases, the deposits of oil and carbon on the minute brush-holder bushes being responsible for the leakage, but how long will they remain sound if the frame be earthed? In the case of hair-dryers, accumulated deposits of carbonised hair in the heater chamber, or actual breakage of the heater spiral with the free ends touching the frame, are also responsible for trouble.

Whatever the cause, I can never repress a shudder when I see any of these appliances in use in kitchens or bathrooms, and I am positive that earthing the frames will only break these machines down earlier than they already fail, owing to the small safety margins provided. Also, in nine cases out of ten they will then be beyond repair.

With the existence of a Press that always sees good copy in an electrical accident, we cannot afford to run big risks with the public in regard to these small appliances. I must confess that I can see no real reason why the body of the articles that I have mentioned cannot be constructed on the lines of some magnetos, with the whole of the electrical portion completely enclosed in a casing of insulating material, with no great increase in cost. Conscientious contractors would push appliances so constructed to the definite exclusion of all other types, as they are aware as well as I am of the dangers that exist with the use of the present flimsily constructed small motor.

T. C. Gilbert.

Folkestone, *October 6th*, 1928.

Electric Heat in the Garden.

I have carefully read the letters which followed the interesting article on the above subject by Mr. R. Borlase Matthews, but, so far, there has been very little written from the horticultural aspect of the question. In electric lighting systems the main line of advance has been due, in the opinion of the writer, to ease of control. In heating by electricity, ease of control also accounts for the rapidly increasing demand for electrical appliances, and economy is reckoned more in time than in thermal units. Unfortunately for the present discussion the average gardener knows little of electrical formulæ and the decimal comparison of coal consumption, but he is well aware of the disadvantages of existing methods of heating, and would certainly welcome the improved system of control possible with electricity, if heating by electricity could be brought within his range at reasonable cost.

The problems of the gardener are many, and call for qualifications not included in the ordinary training of the electrical engineer. The writer of the original article on the subject is evidently aware of a number of the problems of the gardener, and control is one of the distinct advantages that electricity can offer to that useful branch of production. Imagine, for instance, a range of glasshouses heated by the ordinary hot-water system during the kind of weather we are often favoured with in this country, when we have a cloudy period followed by a sudden blaze of sunshine, and the reverse action in the next half-hour or so. No great amount of intelligence is required to understand the advantages offered by electrical control over the ponderous coke-heated systems. The decimal calculations of fuel costs sink into insignificance compared with the gain or loss to the horticulturist concerned with temperature risks to his plants or fruit. When, twenty years ago, some of us were experimenting in our poultry-houses with electric light, we realised the possibilities of reproducing to some extent the tropical conditions required by our barndoor friends, and the prospect now opened out to us by the electrical control of soil temperature is far beyond anything we can at present imagine.

If market gardeners abroad find it advantageous we may know that they are not entirely animated by decimal calcula-

tions of thermal-unit cost. I do not wish to convey the idea that such calculations are of no moment, but I do think that they are not in this instance of such primary importance as the question of control. Cost is by no means the most important standard by which to measure the value of new proposals, and when we take a taxi in preference to a 'bus we ignore the economic question to attain an object of greater importance. In like manner we may miss the main object in the present discussion if we stress the question of fuel cost so much.

E. Nuttall.

Wheathampstead, *October 8th*, 1928.

Do We Need a Mental Change?

Mr. James J. Ratcliffe, in a letter dated September 27th, under "Electrical Slogans," puts a most pertinent question with regard to the advice to "think more, electrically." He says: "Does it mean a mental change?"

Most distinctly and emphatically "yes."

In a paper written in 1923 the writer stated: "Electrical engineers are trying to reach and teach a people whose language they do not speak," so far as the popular use of electricity is concerned.

The paper in question advised a method of "thinking electrically" with regard to the popularising of the domestic use of electricity. The paper was that on which the Electrical Association for Women is founded.

Certain of the electrical industry called it "idealistic," but the thought was translated into action by the Women's Engineering Society, Miss Haslett, E.A.W.'s director, and other pioneers, with the result that an association with over 2,000 members and with branches throughout Great Britain has been built up.

Mr. Ratcliffe will, therefore, perhaps admit that the writer has some grounds for advising folk to think MORE, electrically and in her definition of "thinking electrically" as related to the popular use of electricity.

At the same time, he will no doubt agree that, while we may hope to "think electrically," it is not possible to "think by electricity"!

Where the matter affects electrical engineering is, that the popular and domestic use of electricity is the greatest potential development towards improving and distributing the load away from the peak; and although this is merely stating an electrical platitude—to tackle the job does need a mental change—would it be *very* "ugly" to suggest, from the pedantic, to the popular, outlook, and, in addressing the masses, sometimes, in the words of the classics, to "Come off your perch"?

(Mrs.) M. L. Matthews.

London, *October 5th*, 1928.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged and all subsequent proceedings will be taken.

1927.

6,524. "Electric stoves." J. W. Nasmith. March 9th, 1927. (Cognate application 637/28.) (297,041.)

6,731. "Apparatus for vision by invisible radiation." Television, Ltd., and J. L. Baird. March 10th, 1927. (297,014.)

10,057. "Wireless transmission and reception." J. Robinson. April 12th, 1927. (297,015.)

15,241. "Devices and circuit arrangements in systems for charging electric batteries." A. Mathisen. June 8th, 1927. (297,069.)

15,612. "Electric switchgear." A. Reyrolle & Co., Ltd., A. Allan and J. Mirrey. June 11th, 1927. (297,012.)

15,616. "Driving connection between a motor-driven gear-wheel and a wheel of a vehicle driven thereby." British Thomson-Houston Co., Ltd. (General Electric Co.). June 11th, 1927. (297,013.)

15,769. "Electrically operated sound-reproducing apparatus." W. F. Dunn. June 14th, 1927. (297,072.)

15,872. "Electric batteries." Silica Ge Corporation. June 15th, 1926. (272,916.)

15,914. "Acoustic devices provided with vibratile diaphragms." K. S. S. Spencer and Rees Mace Manufacturing Co, Ltd. June 15th, 1927. (297,139.)

16,044. "Copying-telegraphs and television apparatus." G. Valensi. June 16th, 1927. (297,147.)

16,204. "Acoustic horns." W. E. Beatty (Bell Telephone Laboratories Inc.). June 17th, 1927. (297,151.)

16,205. "Television systems." W. E Beatty (Bell Telephone Laboratories, Inc.). June 17th, 1927 (297,152.)

16,207. "Electric regulating systems." W. E. Beatty (Bell Telephone Laboratories, Inc.). June 17th, 1927. (297,153.)

16,391. "Contacts of relays." Standard Telephones & Cables, Ltd. (L. J. J. Schreiber). June 20th, 1927. (297,157.)

16,527. "Electric circuit-control means." Ritter Dental Manufacturing Co., Inc. March 12th, 1927. (287,041.)

16,697. "Wedged straining clamps for electric conductors." J. W. Hoffmann. June 23rd, 1927. (297,159.)

16,698. "Suspension and straining clamps for electric conductors." J. W. Hoffmann. June 23rd, 1927. (297,160.)

17,025. "Electric switches." General Electric Co., Ltd., and A. E. Angold. June 27th, 1927. (297,164.)

17,610. "Acid-level and charge indicators for electric accumulators." J. H. Collie. July 2nd, 1927 (297,167.)

17,698. "Electric switches and the mounting thereof in wireless inductance coils and the like." T. E. Williams. July 4th, 1927. (Cognate application 30 608/27.) (297,169.)

17,745. "Electric incandescent lamps with concentrated filaments." S. G. S. Dicker (Naamloose Vennootschap Philips' Gloeilampenfabrieken). July 4th, 1927. (297,170.)

18,398. "High-frequency electrical apparatus." W. J. Brown and Metropolitan-Vickers Electrical Co., Ltd. July 11th, 1927. (297,174.)

18,580. "Switch barrels for electric motor starters and/or controllers." Anderson, Boyes & Co., Ltd., and H. H. Guthrie. July 13th, 1927. (297,178.)

18,702. "Control systems for alternating-current motors." Waygood-Otis, Ltd. July 27th, 1926. (275,209.)

19,367. "Devices for the interconversion of electrical and mechanical vibrations, such as loud speakers." British Thomson-Houston Co., Ltd., and G. R. Searle. July 21st, 1927. (297,183.)

20,311. "Apparatus for the prevention of too quick operation or reversal of electric motors." W. H. Scott. August 2nd, 1927. (297,193.)

20,775. "Suspension of live wires of electric railways." F. Berg. August 6th, 1927. (297,195.)

20,876. "Electric transformers." E. D. T. Norris and Ferranti, Ltd. August 8th, 1927. (297,196.)

21,534. "Thermostatically-controlled electric switch." J. Keith and Blackman Co. Ltd., C. Tuson, and F. W. Sharrow. August 16th, 1927. (297,199.)

21,795. "Electric time alarum." C. S. Williams. August 18th, 1927. (297,200.)

21,967. "Wireless receiving apparatus." Compagnie Continentale Trialmo and A. G. Motschan. August 21st, 1926. (276,359.)

23,028. "Devices for automatically controlling the increase of current upon closing an electric circuit." H. Andre and A. Monnier. November 19th, 1926. (280,863.)

23,619. "Control of the speed of electromotors." Smith, Major & Stevens, Ltd., and P. H. Stevens. September 8th, 1927. (297,209.)

24,113. "Insulated damping devices." J. Kalthoff. September 15th, 1926. (277,665.)

25,866. "Electric meters." Brompton and Kensington Electricity Supply Co., Ltd., and A. E. Beale. September 30th, 1927. (297,224.)

25,920. "Electrical heating apparatus for electroplating baths." H. Zander. October 1st, 1927. (297,225.)

27,238. "Lamps for motor cars." J. S. Edwards. Otober 14th, 1927. (297,229.)

27,342. "Thermal control mechanism for electrically-operated liquid-fuel burners and the like." I. E. McCabe. November 8th, 1926. (280,179.)

28,745. "Electrolyte for lead accumulators." Dr. M. Kugel. November 6th, 1926. (280,197.)

30,156. "Live-wire suspension trellis mast, the foot of which is directly set in the ground." Brown, Boveri et Cie. Akt.-Ges. November 10th, 1927. (Addition to 202,834.) (297,239.)

30,884. "Submersible electric motors." B. Kamensky. January 20th, 1927. (283,921.)

31,274. "Antennæ system for wireless telegraphy, telephony, or the like." H. R. Khan and A. G. Khan. November 21st, 1927. (297,243.)

31,534. "Separators for the electrodes of electrolytic cells." J. L. Woodbridge. November 23rd, 1927. (297,246.)

32,143. "Increasing the electric disruption strength of resistance of films, consisting of cellulose esters or cellulose ethers." M. Ow-Eschingen. December 1st, 1926. (281,665.)

32,906. "Manufacture of magneto bodies." C. Vaughan and F. H. Adams (1926), Ltd. November 30th, 1927. (297,248.)

33,604. "Process and apparatus for undisturbed radio communication." J. Plebanski. December 12th, 1927. (Addition to 283,190.) (297,253.)

34,636. "Coatings-conductor of electricity for electroplating non-metallic articles." K. Baranowski. December 21st, 1927. (297,260.)

34,819. "Thermo-electric pyrometers." G. E. Lloyd and Electroflo Meters Co., Ltd. December 23rd, 1927. (297,261.)

35,114. "Safety braking device for electrically-operated track vehicles." A. Ewen. December 28th, 1927. (297,264.)

1928.

35. "Electromagnetic unit for telephone instruments." Hopkins Corporation. January 7th, 1927. (283,213.)

530. "Electrical insulators or the like." J. E. Pollak (Hermsdorf-Schomberg-Isolatoren Ges.). January 6th, 1928. (297,265.)

2,341. "Field magnets for magneto-electric machines." Magnetos Lucifer Soc. Anon. January 26th, 1927. (284,265.)

2,540. "Apparatus for reproducing recorded sound." H. J. Kuchenmeister. January 27th, 1927. (284,290.)

3,834. "Head lamps for motor vehicles." V. Biglia and G. U. Corzolino. February 7th, 1927. (284,996.)

5,664. "Thermionic-voltage regulating devices." E. B. Moss and Cambridge Instrument Co., Ltd. February 17th, 1928. (297,278.)

5,958. "Carrier-current supervisory systems." British Thomson-Houston Co., Ltd. March 5th, 1927. (286,601.)

6,858. "Antennæ systems for wireless telegraphy, telephony, or the like." K. B. H. R. Khan. March 5th, 1928. (297,287.)

15,050. "Circuit arrangements suitable for use in radio signalling." Marconi's Wireless Telegraph Co., Ltd. May 23rd, 1927. (291,012.)

15,800. "Apparatus for use in television." L. Thurm and P. Gaisenband (*née* Levy) (trading as Etablissements Ariane). May 30th, 1927. (291,305.)

16,078. "Coil junction boxes for submarine cables." Felten & Guilleaume Carlswerk Akt.-Ges. June 1st, 1927. (291,412.)

16,284. "Mercury-jet pumps used in conjunction with mercury-vapour rectifiers." International General Electric Co., Inc. June 7th, 1927. (291,744.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 3rd, 1928:—

G.K. (lettering and design). No. 492,014. Class 8. Philosophical instruments and apparatus for useful purposes.—George Kent, Ltd., 199-201, High Holborn, W.C.1.

Justophot. No. 494,541. All goods in Class 8.—Drem Products Corporation, New York. (British representatives: Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.).

Sol-Lux. No. 493,014. All goods in Class 13.—Westinghouse Electric and Manufacturing Co., East Pittsburgh, U.S.A. (British representative: A. S. Cachemaille, 2, Norfolk Street, Strand, W.C.2.)

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ARDROSSAN.—Telephone exchange, for the Postmaster General.

BEDDINGTON AND WALLINGTON.—Houses (72), Elm Grove Estate, for Stanford & Co.

BILLINGHAM.—Club and hall, Haverton Hill, for the British Legion; secretary. Houses (75), for the U.D.C.; Patrick Duffy, builder, Stretton House, Norton. Development of estate for houses; Harland & Parker, West Hartlepool.

BOLTON.—Technical college, Central area; Education Committee. Power house off Chorley New Road; governors of Bolton School. Workshop, Breightmet Street; N. Isherwood & Co.

BRAINTREE.—School (£6,870), for Essex E.C.; T. J. Bailey, builder, Chelmsford.

BRIGHTON.—Nurses' home (£45,963), for the B.G.; clerk.

BROMLEY (Kent).—Housing scheme (91), Southborough, for the T.C.; Harold Cliffe, borough engineer (returnable deposit of £2 2s.). School, Bromley Common, for the Borough E.C.; clerk.

CHELMSFORD.—County office extensions for Essex C.C.; W. S. Sharpin, Bow.

CHESTERFIELD.—Extensions, Walton Works, for Robinson and Sons, Ltd.

CHORLEY.—Houses (110), Gillibrand Estates, Ltd.

CLECKHEATON.—Erection of shops in Cheapside, for the Industrial Co-operative Society, Ltd.; R. Castle & Son, architects, Midland Bank Chambers.

DAGENHAM.—Extensions, works, Dagenham Docks; Major and Co., Ltd.

DERBY.—Housing scheme (750), Osmaston, for the T.C.; borough surveyor.

DEWSBURY.—Garage, offices, &c., George Street depôt, for the T.C.; H. Dearden, borough surveyor.

DONCASTER.—Artificial silk factory, Wheatley; for British Bernberg, Ltd.

DOUGLAS (Isle of Man).—Extensions, King William's College (£10,000), for the trustees; secretary.

DUDLEY.—Extensions, Fountain Arcade, Market Place; T. W. Tanfield.

DUNDEE.—New headquarters for police department (£30,000); city architect.

EASTBOURNE.—28 houses, Victoria Drive; J. H. Thompson and Sons, Ltd., Grimsby.

ECCLES.—Extension of Eccles and Patricroft Hospital; secretary.

EDINBURGH.—Cinema and theatre, Dalry Road, Haymarket, for the Provincial Cinematograph Theatres, Ltd. Extensions for Caley Picture House Co., Ltd.; the manager.

FALKIRK.—Church at Laurieston; the Rev. James Whyte, Laurieston U.F. Church. School (£80,000), for Stirlingshire E.C.; education architect, Stirling.

FELSTEAD (Essex).—Sewage scheme, Beet Factory; Beet Sugar Corporation.

GLASGOW.—Shops, Baldwin Avenue, Knightsbridge; Anniesland Co-operative Society, Ltd.

GRAVESEND.—Bazaar premises, High Street, for F. W. Woolworth & Co., Ltd., Kingsway, London.

GREENOCK.—Alterations to the Picture House; the manager.

HARROW.—Houses (152), Roxeth Park Estate; Wall & Rolnick, architects.

HENDON.—School (£48,049), for Middlesex E.C.; R. Ginn and Son, builders, Hertford.

HODDESDON (Herts.).—Houses (200), Rye Park, for Homemakers, Ltd.

HOUNSLOW.—Theatre, London Road; N. Parr, architect.

IRISH FREE STATE (Grangegorman, Co. Dublin).—Extensions to Mental Hospital; P. J. Munden, 28, South Frederick Street.

(Lough Derg, Co. Limerick).—Electric wiring installation for church and other buildings of St. Patrick's Purgatory; MacEntee & O'Kelly, consulting engineers, 23, Upper O'Connell Street, Dublin.

KIDSGROVE (Staffs.).—Church (£5,600), for the Wesleyan trustees; John Wills & Sons, architects, Derby; Stephen Heath & Sons, builders, Newcastle, Staffs.

KIRKCUDBRIGHT.—Ten blocks of houses for the T.C.; burgh surveyor.

LANARKSHIRE.—Roman Catholic Church at Carfin; Rev. Father Taylor, St. Francis Xavier, Carfin.

LONDON (East Ham, E.).—Hospital; Corporation and Essex C.C.

(Ilford, E.).—Development, Mossford Green Estate, Barkingside; Mr. Hobbs.

(Bermondsey, S.E.).—Laundry for Maxwell Laundry, Long Lane, Andrews & Peascod, architects. Alterations, factory, 289, Tooley Street; Almond Franey & Son.

(Greenwich, S.E.).—Houses (76), for the T.C.; Perrys (Ealing), Ltd., builders.

(Lewisham, S.E.).—Receiving and casualty wards and outpatients' department, for the B.G.; J. Douglass Matthews & Son & Ridley, architects, 3, Paul's Bakehouse Court, Godliman Street, E.C. (returnable deposit of £5 5s.).

(Hammersmith, S.W.).—Houses (80), for the T.C.; Wilson, Lovatt & Son, Ltd., Wolverhampton.

(Kensington, S.W.).—Alterations, St. Barnabas Church, Addison Road; churchwardens.

(Wimbledon, S.W.).—Station and shops for Southern Railway Co.; engineer.

(St. Marylebone, W.).—Buildings, Seymour Place, &c.; W. E. Masters.

MAIDSTONE.—Development of Shepway Court Estate (500 houses); W. T. Burrows & Son, builders.

MALDON (Essex).—Housing scheme (30), for the R.D.C.; W. Almond, surveyor, 6, Market Hill.

MANCHESTER.—School, Aspinal site; Marshall & Sons, Ltd., Ashton-under-Lyne. Extensions, Xaverian College; governors. 300 houses, Barlow Moor Estate, by direct labour; city architect.

MORECAMBE.—48 Corporation houses, to be completed by March 31st; borough surveyor, Town Hall (deposit £5 5s.). Covered market (£3,850); borough engineer.

NEWCHURCH.—School (400 places), for Lancs. E.C.; director of education, Preston.

NEWMILNS (Ayrshire).—Offices, hall, &c. (£3,600), for the T.C.; burgh surveyor.

NORTHAMPTON.—Extensions to Cinema, Grove Road; Mr. Norfolk. Relief offices and waiting room, Portland Street; Board of Guardians. 'Bus station, Horseshoe Street and Gregory Street; United Counties Omnibus Co., Ltd.

NORTHWICH.—Housing scheme (56), Rudheath, for the R.D.C.; J. Birtwistle, surveyor (returnable deposit of £2 2s.).

OXFORD.—Extensions to Radcliffe Infirmary (£170,000), with X-ray and electrical departments, and with heating and hot water work; secretary.

PRESTON.—Operating theatre, hospital, for the B.G.; clerk.

RAWTENSTALL.—Rehousing scheme (52). Hall Carr; Leach and Unsworth, builders, Newton Heath, Manchester.

ROTHERHAM.—Premises, College Street; F. W. Woolworth and Co., Ltd.

SHEFFIELD.—Meat market extensions (£39,000); city architect.

SLOUGH.—Club premises, Stoke Road, for the British Legion Club; secretary.

SMETHWICK.—Administration block, Holly Lane Hospital; Joint Hospital Committee. Extensions, High School, Holly Lodge; G. Randle, architect. Extensions, works, Grove Lane; E. J. Guest, Ltd. Extensions, Soho Foundry; W. & T. Avery, Ltd.

STAMFORD.—School for Kesteven E.C.; director of education.

STOCKPORT.—Wallpaper factory, Bredbury, for Lightbown and Aspinall, Percy Street, Pendleton, Salford.

TILMANSTONE (Kent).—Cement works, with electrical scheme; R. Tilden Smith, principal of the colliery.

TWICKENHAM.—Houses (56), Chudleigh Estate; Brewer, Smith & Brewer, architects. Extensions to York House Hall (£7 50), for the T.C.; borough engineer.

WARMINSTER.—Bank, Market Place, for the National Provincial Bank, Ltd., London.

WARWICK.—Development of Stivichall Estate for houses; J. G. Gray.

WESTON-SUPER-MARE.—Two schools for Somerset E.C.; director of education.

WEST WICKHAM (Kent).—Houses (144), Coney Hill Estate, for the Kent & Surrey Estate Co. Houses (39), The Mead, for J. C. Derby.

WINDSOR.—Nurses' hostel, King Edward VII Hospital; secretary.

YORK.—Estate development, Holgate Gardens; Yorkshire Insurance Co., Ltd.